



MUSEUM
ALLIANCE

QUARTERLY

LOS ANGELES
COUNTY MUSEUM
OF NATURAL HISTORY
VOL. 7 NO. 2
FALL ISSUE 1968





This Quarterly—48 pages in full color—comes to all Museum Alliance Members as a special bonus in honor of the opening of the new Arms and Armor Hall.

Why the Alliance?

Museums are sometimes likened to an iceberg, showing only a fraction of their content; but an increasingly large part of our museum is available to interested people.

In the case of the Museum of Natural History, the people are mostly members of the Museum Alliance.

There are many reasons why they support the Museum. This publication is an excellent example. Often their reasons are related to a specific family or individual interest in some aspect of the Museum. For others the Alliance serves as a doorway to discovery.

Membership in the Museum Alliance means behind-the-scenes peeks at the laboratories, or a whale hunt off San Diego as part of the "Dimensions to Delight" program. It means special previews of newly opened halls and exhibits; curiosity-prodding summer classes for kids; world-ranging travel programs; discounts at the Museum Bookshop (the *QUARTERLY* comes free), and other programs.

But in one sense, these are only reasons for being an **active** member of the Museum Alliance. The reason for being a member goes deeper. It has to do with the past and future benefits derived from the Museum.

You support the Museum because of a childhood of Saturday afternoons filled with wonder and discovery. You support the Museum because of a tomorrow that may be enriched by the presence of a thing that is no more, or by a piece of research growing—not out of a need of an over-functionalized society—but out of pure inquisitiveness.

Like a college, the Museum of Natural History has a value that extends far beyond the time of its direct use.

The growth of the collections and of the programs of the Museum depends on the support given it by individual and corporate members of the community. As the contributions of the Alliance grow, the Museum's legacy increases, and so does its ability to serve the varied interests of the entire community.

The Museum is a cultural asset which must be given the freedom to grow simply because we would be poorer without it.

You can become a member of the Museum Alliance by sending your check to:

Museum Alliance
Los Angeles County Museum of Natural History
900 Exposition Boulevard
Los Angeles, California 90007

(Two cards will be sent if you register as Mr. and Mrs.)

Membership privileges and pleasures include:

1. Subscription to the Alliance *QUARTERLY*
2. The monthly *CALENDAR OF EVENTS*
3. Family participation programs—*NEW DIMENSIONS TO DELIGHT*—tickets available only to members
4. 20% discount on most items at the Museum Bookshop
5. Invitations to previews and receptions for new exhibitions and to meet lecturers
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7. Additional selected publications
8. An ever expanding program of benefits for children

Memberships are available in the following categories:

Active	\$12.50
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About the Cover: As a "hands-across-the-centuries" tribute to the Museum's new Arms and Armor Hall, George Bartell's art construction of steel and wood captures the violence, the beauty and the craft of another time as seen through the eyes of 1968. photo by : Dick Vartian

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OF NATURAL HISTORY
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ARMS & ARMOR

"There is a child's toy of sound and fire made in various parts of the world with powder of saltpetre, sulphur and charcoal of hazelwood. The powder is enclosed in an instrument of parchment the size of a finger, and since this can make such a noise that it seriously distresses the ears of men if one is taken unawares, and the terrible flash is also very alarming, if an instrument of large size were used no one could stand the terror of the noise and the flash. If the instrument were made of solid material the violence of the explosion would be much greater."

Roger Bacon,
Opus Tertius, 1266

by **Russell E. Belous**
Curator of Western History

The recipe was a simple one: seven parts of saltpeter (potassium nitrate), one part of sulphur (a non-metallic element), and one and one-half parts of charcoal. Add a pinch of sal ammoniac, arsenic, antimony, a few drops of alcohol (instead of water.) Mix thoroughly and for the best results keep the mixture damp until almost ready to serve. Dry it quickly then and, depending on whether you are the cook or the consumer, the result will be the most constructive (or destructive) broth for nearly 700 years—or until other cooks at the University of Chicago produced the ultimate broth.

The results of the recipe were first used in fireworks and, as Roger Bacon prophesied, it became a propellant in an instrument of solid material — a firearm. But long before firearms there were stones, at first crude, then after a million years finely polished. These were followed in many places by instruments of copper, bronze and iron. Where they appear as weapons we call them spears, polearms, swords.

Man then attacked the final problem of defense. He was a vertebrate animal with an endoskeleton, which, ultimately, had permitted him to walk upright and

to use the weapons; but many other animals, not of his Phylum, had a hard exterior shell for protection. Could not man also develop a synthetic exoskeleton? Yes, and he would come to call it **armor**, whether it was of leather, bone or steel.

All of this is by way of introducing you to the History Division's newest permanent gallery — Arms and Armor. It is our intention that these pages will serve not only as a preface to an understanding of the artifacts but also will allow us to more formally thank the more than one hundred individuals who contributed their energies and, many of them, their fine personal collections. And if these brief, introductory remarks seem to omit a definite discussion that I know many of you will expect (for example, where was gunpowder really invented: China, the Middle East, or in Europe by Roger Bacon?) — do not despair! There is now available a complete account in *The Arms and Armor Catalog* for sale at the Museum Book Store in both paper and hard cover.

A display of firearms, edged weapons and armor will evoke in the visitor (as

perhaps no other artifacts can do) a variety of thoughts and images. Some will view them as works of art which rival in their execution the best ceramics, enamels, bronzes and paintings. Whether it be the etched, gilded and embossed armor or the richly wrought swords incrustated with silver and gold or some of the earlier and simpler implements which were beautiful in their lines and surfaces rather than in their mere enrichment, the product from the armorer's workshop was an art form. His art is now almost extinct; his processes were varied and knowledge of them was often guarded jealously. His implements were things apart, with scores of curiously shaped hammers and anvils, and a formidable array of eccentric pincers, files, saws and vises — objects which their owners sometimes elaborately ornamented, incised and sculptured. And then, of course, there was the anvil, as much the pride, I suspect, of some sixteenth-century armorer as of a blacksmith in Abilene, Kansas, some 400 years later.

Some of you, no doubt, will be interested as well in the history of man's technological achievements: of metal-working, of machine-making, of inven-



Italian (Milanese) Suit
of Armor, 16th century

Dr. Justin J. Stein
Collection

tion and discovery. Here there will be many roads, side-streets and footpaths. There are as many stories as artifacts. These artifacts may tell of the states that rose and fell in the Mediterranean and west European areas; how their prosperity depended upon their ability to subdue their neighbors, to defend a civilization against barbarian invaders and to protect trade. Other artifacts will show the growing relationship and interdependence of science and technology and culture. In this connection it has been written that "... history is a bag of tricks which the dead have played upon historians . . . (and) the most remarkable of these illusions is the belief that the surviving written records provide us with a reasonably accurate facsimile of past human activity." These remarks, by Professor Lynn White, Jr., (who spoke at the Alliance luncheon last year), were concerned with the problems of studying medieval history.

Our knowledge of feudal aristocracy of medieval Europe comes largely from clerical sources which naturally reflect ecclesiastical attitudes. Not only did the knight not speak for himself but it was not much later that the merchants, manufacturers and technicians began to share their thoughts with us — and of course the peasant was the last to find his voice. So some historians have lately become interested in the surviving artifacts of the Middle Ages; and since "hardware" (eg. arms and armor) has often been the best preserved artifact, it is through this study that the question of technology and social change is made more meaningful. On the field of battle, for example, the medieval knight cut a very different figure from the Roman legionary, because of changes not only in metallurgical technology but also because of changes in methods of fighting; the latter caused in turn by the significant differences in the cultural life of the two peoples. Several exhibit cases have been prepared especially to expand our knowledge in this field by the use of the comparative approach. Exhibiting a variety of arms and armor from the Museum and private collections, augmented by a number of unique pieces from the fine collection of the Metropolitan Museum of Art, the visitor will be able to move easily and quickly in

time and space from the 15th century to the 20th century, from Europe to Persia to the Philippines and, finally, to the United States.

It is sometimes difficult, and occasionally impossible, to adequately describe and fully understand an artifact—and this is especially true of weapons. How may the instinctive, deep-rooted respect for weapons and the way they are treasured be explained? From where comes the ever present inclination to preserve arms, to collect and to surround oneself with them while alive, and then to place them in graves for a later life? Certainly they are important as reminders of the past; recalling the gratitude toward a weapon which has saved one's life, of a memento when a life was risked or even sacrificed for the protection of dependents, of a country or, perhaps, of a way of life. This sacrifice for a cause or an ideal is almost universally recognized, and the carefully preserved weapons of nearly all cultures focus special attention on this aspect. And even though we will differ in our definition of this commitment it is, unlike the turmoil of war, never senseless, criminal or tragic. We recognize, of course, that human nature is ever inclined towards abuses, and weapons have proved no exception. Apart from the purposes of defense, self-preservation and food gathering, a weapon properly wielded is often a demonstration of strength, of manhood, of superiority, of pride in victory. So too will weapons encourage the struggle for status, the lust for power and the desire to dominate. As we thus examine the history of *Homo sapiens* (wise man?) by looking at his weapons, some may regard this history as an eternal series of compromises in man's search for survival; and this biological need for survival, as far as weapons are concerned, may be expressed as excess tempered by moderation and self-restraint.

The gallery itself is divided into two equal parts. The first will take us through the 17th century and, as we enter into the second part, we will be able to view the consequences of the invention of gunpowder, the gradual diffusion of military concepts throughout the world, and the subsequent changes wrought by the technological revolution

of the 18th and 19th centuries. In the second half of the gallery there will be examples of the most outstanding civilian and military weapons. Four major geographic areas will be represented: Far East, Near East, Europe and the United States. Of special interest to American history buffs will be a comprehensive chronological display showing the evolution of American weapons, with emphasis on the early colonies, the Revolutionary War, the Civil War and the Indian Wars of the late 19th century. The Spanish-American War will be highlighted by the (in)famous, and now rare, Gatling gun.

James Thurber once remarked that without uniforms there would be no warfare — since there would be no easy way of distinguishing friend from foe. As science, during the 17th century, began to make effective use of technology as a tool, and as mass production techniques took hold during the 18th century, the uniforms and their amazing variety of accoutrements soon became as distinctive as the countries they represented. Several examples will be displayed, some drawn from the museum's fine collection, others will be shown as scale models constructed by the skilled craftsmen of the Exhibition Division.

There will, finally, be a special area for temporary exhibits featuring outstanding private collections. These will contain material of interest to the advanced collector, the specialist, the connoisseur of the rare and unique collections, seldom seen by the general public. The first of these exhibits will afford the visitor an opportunity to see the world famous Robert Abels' collection of Bowie knives.

We have been talking about the contents of a gallery as if somehow they had held themselves in readiness over the centuries waiting for the magic moment to make their appearance. But of course they could not. A collection such as this can only be the result of many long, patient years of constant search — by museum curators and private collectors. And what then follows is the loving care, the careful cleaning and restoration, the research and cataloguing, sometimes as if these were your own offspring. They are numbered and, finally, a temporary home is prepared until

that day when they can be admired by everyone.

As in all living forms, collections in museums must begin with "seeds." For the Los Angeles County Museum of Natural History, as some of you will remember, the seeds of **this** gallery began over a half-century ago. General Harrison Gray Otis was not only the founder of the Los Angeles Times, not only a General during the Spanish-American War, not only a forceful and often controversial figure, he was interested as well in the cultural life of Los Angeles. His home, "The Bivouac," was given to the County of Los Angeles and, shortly after his death in 1916, was re-named the Otis Art Institute. His large and varied collection of weapons was soon transferred to the Museum and in several years was enlarged to over 1800 items by an additional gift of his son-in-law, Mr. Harry Chandler. The Otis collection, bearing the accession number A.992, was opened for public view on April 14, 1921. It was "arranged" by Mr. J. J. Allard, owner of "The Old Curiosity Shop and Free Museum" in St. Louis, Missouri. He had long been a friend of General Otis and had sold him a number of the more outstanding pieces. Allard's exhibit techniques were, by modern standards, unusual; the room on the mezzanine was small, and existing photographs seem to suggest that probably all of the 1800 weapons were shown! Here it was for twenty years, with time out for refurbishment in 1935, until the room was needed as a "print room" by the Art Division. Last year this room was occupied by the Southern California Academy of Sciences; and the original bronze plaque with its inscription is still over the door:

"Collection of the late General Harrison Gray Otis Given to the museum by his daughters Mrs. Harry Chandler and Mrs. Franklin Booth and his grandchildren, the children of Mrs. A. M. McPherron."

The weapons, with a few exceptions, were stored in the "gun room," a euphemism for a large closet. And for twenty seven years they remained behind a locked door; but they were never forgotten! It may not be an exaggeration to suggest that the entire museum staff (especially the guards) had been ap-



Chinese Officer's Armor,
circa 1840
Imperial Palace Guard
Mrs. Manfred Meyberg
Collection

proached at least once during this long period by an anxious visitor who would ask: "what ever happened to that gun room on the mezzanine that I enjoyed so much when I was a boy?"

So in spite of this age of push-button warfare and cheap plastic toy weapons from Hong Kong (and real albeit stamped-out M-16 rifles) there remained somehow an aura of past splendour and magic of weapons; and since 1940, several important collections were added to the History Division's inventory of arms and armor: The Theodore Roosevelt Camp of the Spanish-American War, over 1500 items; Captain Clarence Albert Patton, 232 items; Mrs. Horace E. Downing, 41 items; Hinman-Garland, 328 items; Dwight Franklin, nearly 100 items; Dr. Justin Stein, 124 items.

Like an adolescent, the collection grew during these years almost without design. By 1960 it had outgrown the closet and the museum decided to bring it to what it hoped would be a successful adulthood. As with any collection this can be accomplished only if three conditions are met: 1) adequate workshop and storage facilities; 2) an exhibitions and publications program; 3) staff. From this point on, as the collection matured and the plan unfolded, the story becomes more difficult to tell. It is a complex one made up of many contributors and much research.

I am not unlike most curators who find it impossible "to adequately express gratitude and appreciation" to all who made this Hall possible. While this is a well-worn cliché, it is nevertheless true. Therefore I would here extend my warm thanks to the Board of Governors, and especially to Mr. Ed N. Harrison and Mr. C. V. Duff, for their constant encouragement; to Museum Director, Dr. Herbert Friedmann for his patience and wise counsel (as I recall he said **no** only once — when I suggested that he model a suit of armor at the opening); to Ken Hooker who is responsible for the design of what I feel sure will be the most interesting and provocative hall of Arms and Armor in this country; to Charles Schwartz and Konrad Schreier, of the Museum Alliance, who spent many days searching for material, cajoling collectors and otherwise helping make sure that we would have the best possible Hall; to the Education Division's Russell



German Crossbow, 17th
century with Crannequin

Dr. Justin J. Stein
Collection

Smith and Warren Schweitzer for their design of a unique audio-visual system, which we know will make this Hall far more meaningful for many thousands of school children.

But it is time now to stop reading and begin looking — first at the fine photographs, by Armando Solis, accompanying this essay and then at the gallery itself. We know that you will find the exhibit as interesting as it is instructional; and as you evaluate and compare each item, we hope that you will come away with a greater awareness of how the displayed artifacts often point to historic roots — traditions common to nearly all peoples on this planet.

Firearms



Gatling Gun, Model 1895

Marked: "Gatling Gun
Patented, Mfg. by Colt's
Pt. F. A. Mfg. Co., Hart-
ford, Conn. #1028"

On Original carriage, ten
barrels, .30 caliber, with
(replica) Bruce Feed

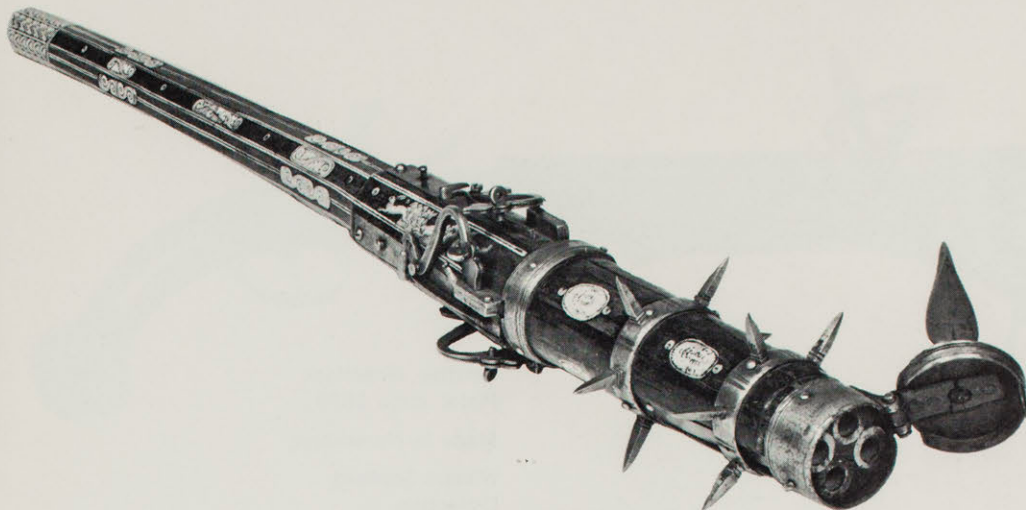
William J. Luther
Collection



United States North
Flintlock Pistol,
Model 1808

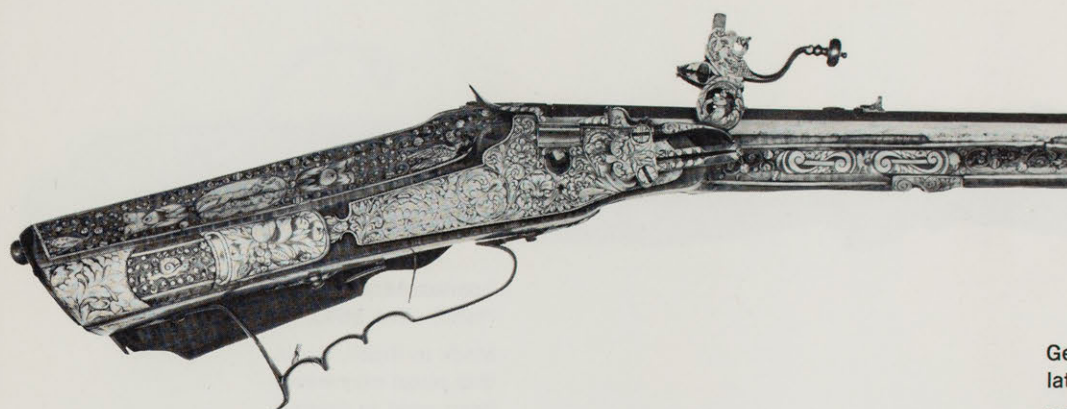
Marked U. States;
with belt hook

Col Berkeley R. Lewis
Collection



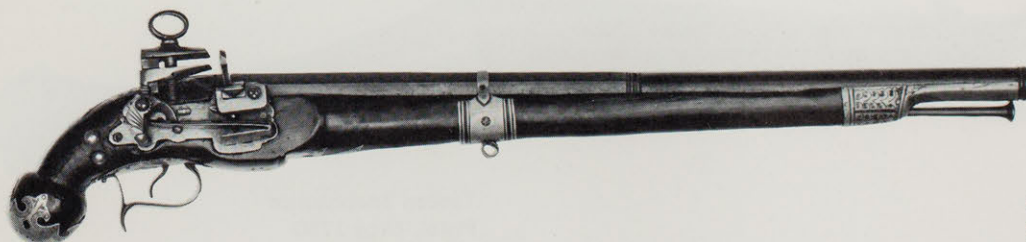
German Combination
"Holy Water Sprinkler"
and Four-Barreled
Matchlock Musket,
late 17th century

Gift of Charles M.
Schott, Jr., 1917
Lent by The Metro-
politan Museum of Art



German Wheellock Rifle,
late 17th century

Gift of William H. Riggs,
1913. Lent by The
Metropolitan Museum
of Art

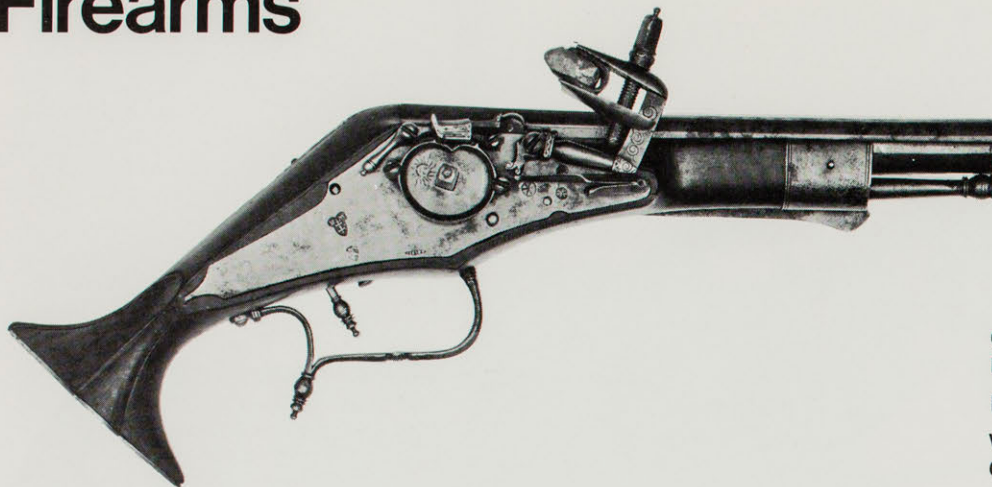


Spanish Miquelet Lock
Pistol, circa 1680

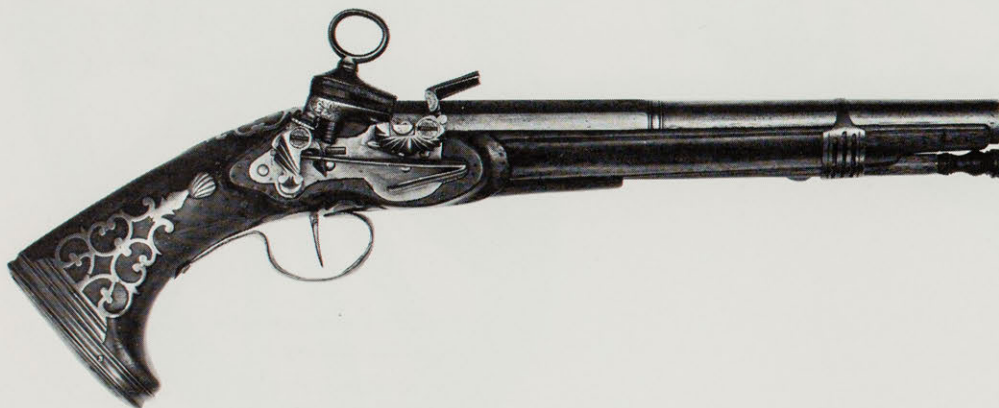
Made in the province
of Catalan, Spain

William Scollard
Collection

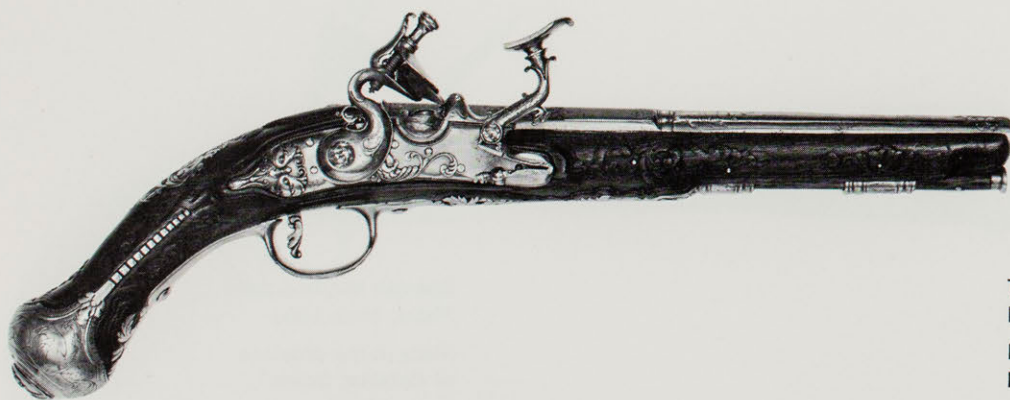
Firearms



German Wheellock
Pistol, circa 1570
Made in Nuremberg
William Scollard
Collection



Spanish Miquelet Lock
Pistol, circa 1640
Made in Ripoll, Spain,
this pistol may have
been used in Cuernavaca, Mexico
William Scollard
Collection



Tuscan Snaphaunce
Pistol, circa 1750
Made in Anghiari, near
Florence, Italy
William Scollard
Collection



French Flintlock Horseman's Pistol, circa 1740

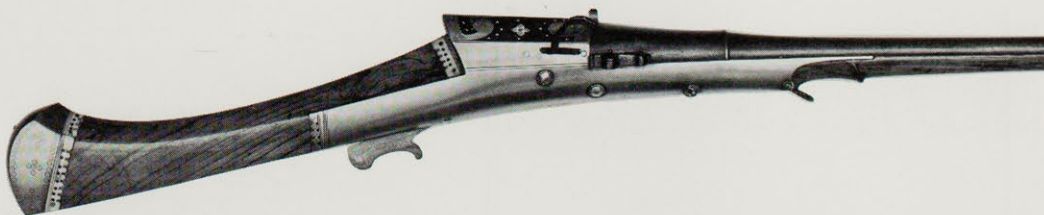
For presentation to a Middle Eastern ruler, with a damascened barrel and lock and silver wire inlay in carved ebony stock

William Scollard Collection



Japanese Two-Shot Breech Loading Pistol, late 18th century

William Scollard Collection



India Matchlock Musket, 19th century

Nick Scollard Collection

Uniforms Armor and Helmets



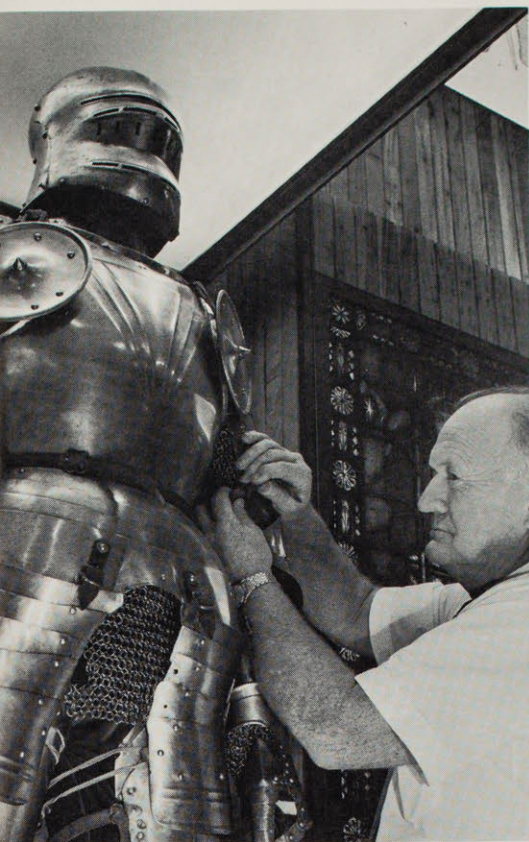
United States Army
Spanish-American War
Uniform, 1898

Mrs. Elizabeth Erickson
Collection



German Three-Quarter
Suit of Black Armor,
Circa 1600
With leather boots
(restoration)

Ron Walters Collection



German Suit of Armor,
1500
Transitional from Gothic
to Maximilian

With Ken Hooker,
Head Preparator

Lent by the Metropolitan
Museum of Art
The Bashford Dean
Memorial Collection
Bequest of Bashford
Dean, 1928



Italian (?) Cabasset,
16th century

Dr. Justin J. Stein
Collection



German Spiked Helmet
(Picklehaube),
circa 1900
Officer's 5th Guard
Infantry Regiment

Stanley Trimbur
Collection

Edged Weapons

United States Mounted
Artillery Officer's Saber,
circa 1825

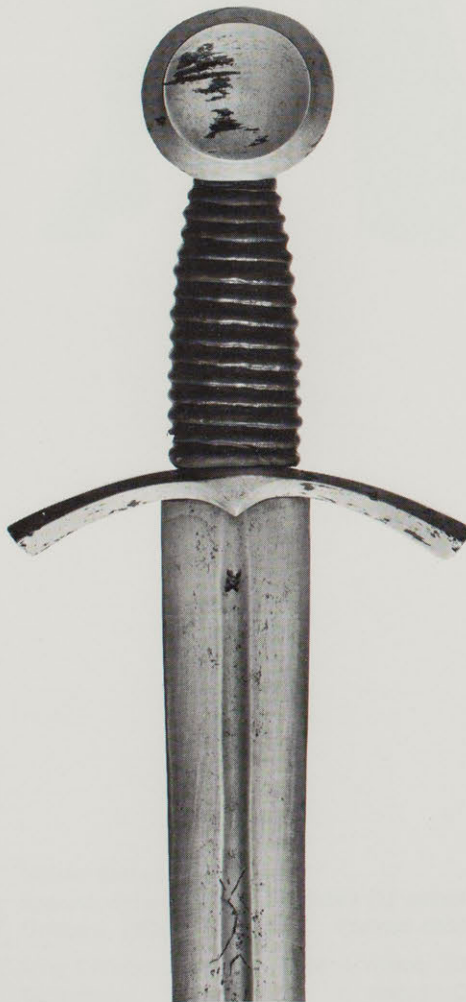
Mrs. William May
Garland Collection



French Sword,
15th century

Gift of William H.
Riggs, 1913

Lent by The Metropolitan
Museum of Art



Indonesia Kris Dagger,
19th century

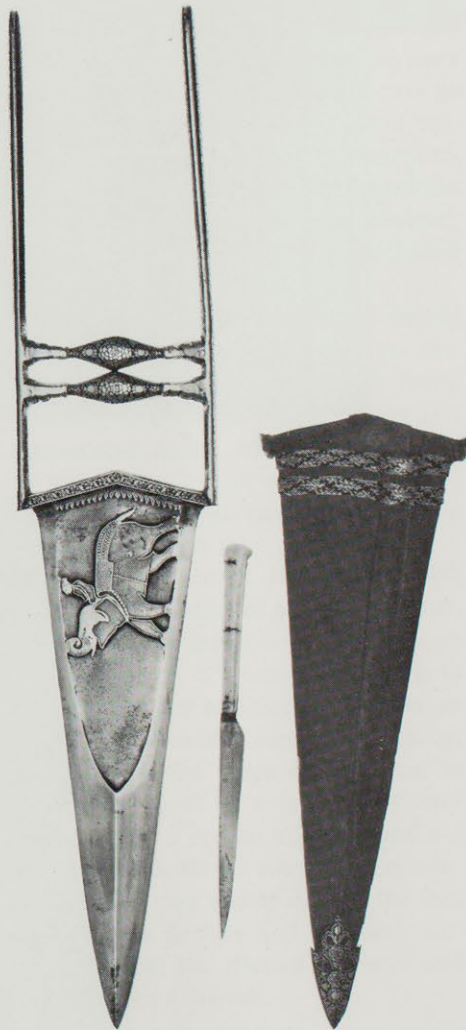
Dr. Justin J. Stein
Collection



India Jambiya
Dr. Justin J. Stein
Collection



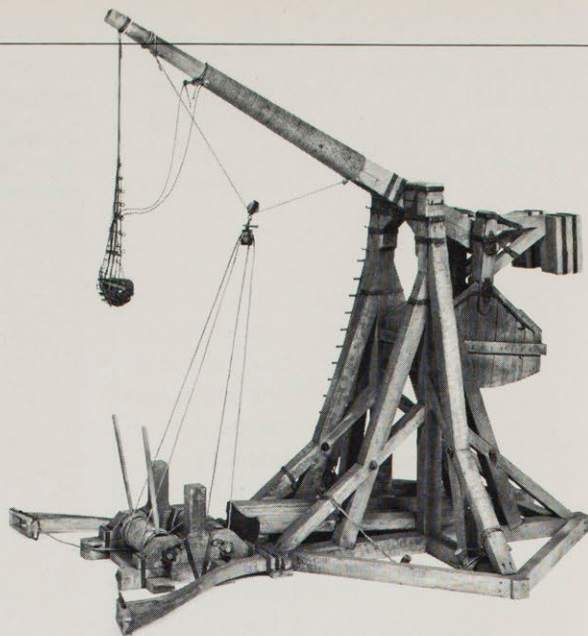
India Katar Dagger,
18th century
Dr. Justin J. Stein
Collection



Persian Khanjar Dagger,
19th century
Dr. Justin J. Stein
Collection

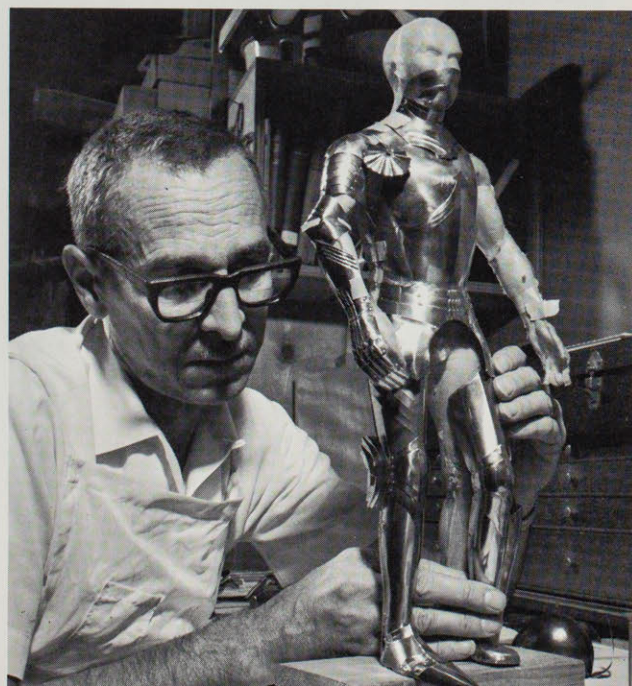


Large Siege Weapon
(Trebuchet), 14th
century
Museum model
by Jack Alexander



"Original" Arms and
Armor Hall, circa 1935
On mezzanine

Figure in Full Suit of
Armor with Sword
Shows Jack Alexander
constructing model



Stained Glass Panel
Modern reproduction by
Jerry Campbell
(shown here)

The three stained glass windows in the Arms and Armor Gallery serve two purposes. To the observer entering the gallery they help to create the atmosphere typical of the era most associated with arms and armor — the Middle Ages.

Artistically, they are a medium for presenting specific information about arms and armor.

Since actual stained glass was not available, we arrived at the solution of taking medieval illustrations, not window designs, and translating them into the stained glass technique of each age shown.

We have attempted to combine the decorative and informative aspects into the three units. They show three periods of accoutrements in three styles of stained glass.

The window to the left of the center window is in the style of 1277 A.D. It shows the nearly exclusive use of chain mail. The window to the right of the center one is an example of glass of about 1380 A.D., and shows a combination of chain mail and armor. The center window carries the date in its design, 1508 A.D. It shows a full suit of armor, as well as horse armor.

The technical problems of reproducing stained glass were many. Nothing can duplicate the depth and subtle brilliance of real glass, and the simulating of age is another problem. We were therefore faced with creating as good a substitute as money and time at hand could devise.

Single sheets of quarter inch plexiglas measuring the total window area were the working surface. The illustrations were reworked to eliminate unnecessary line, and translate the important lines into what would be the supportive and decorative leading surrounding each piece of glass. Only these lines were projected onto the plexiglas at this stage. The number of colors to be used were selected, and every part of the plexiglas except the desired color area was masked



out. Transparent automotive lacquers were sprayed on with particular care to achieve as much transparency and brilliance of pigment as possible. This process was repeated for each color until the entire sheet of plexiglas was covered, and looked somewhat like a patchwork quilt.

The next step was to paint the details of pattern, texture and line onto the surface. Each color section, before being detailed, was steelwooled, antiqued and steelwooled again. Attention was given to making the center of each "piece of glass" lighter and more brilliant. The painting of detail then proceeded.

In actual windows, the leading used to hold each section of glass to the next, and to create strong linear patterns, is shaped like an "I" beam. Obviously, in the case of our one-pieced windows we could not follow this method of leading, so we used flat strips of lead, cut to length and bent to shape. These were applied with a special adhesive and the joints then soldered with liquid solder.

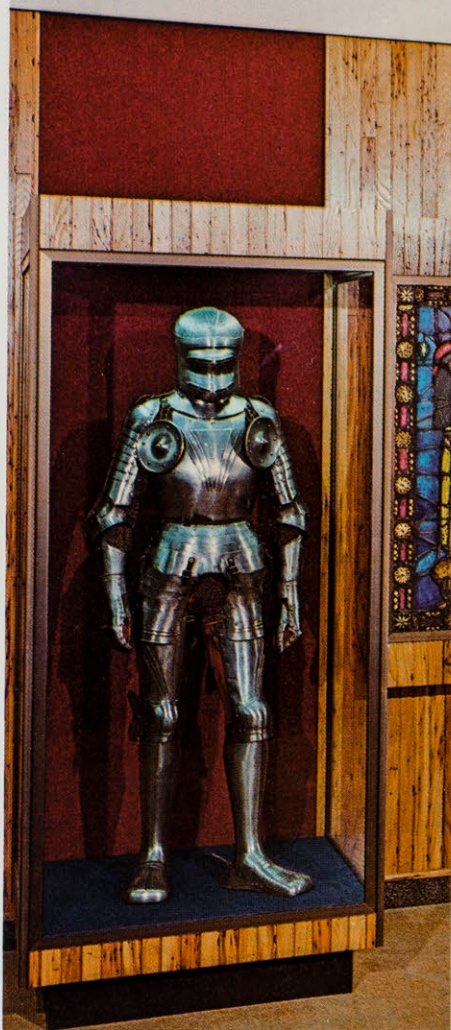
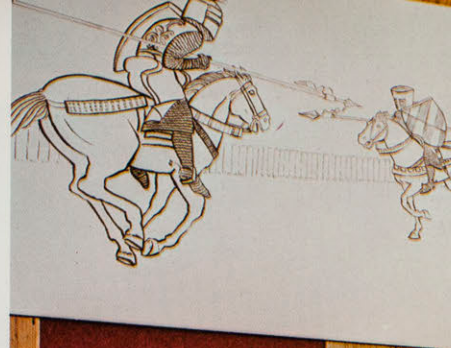
The final step was to antique the lead and window surface and the back surface, so that the illusion of depth and age might be achieved.

Each window attempts to portray the development of the medium of stained glass. The earliest window, that of 1277 A.D., shows simpler colors, the clear reds and blues predominating at this time. The pieces of glass are smaller, more mosaic-like. Human features and drawing are not necessarily realistic, but stylized.

The window of 1380 shows larger areas of glass, a more extensive use of color, and much greater preoccupation with three-dimensionality, shading and literal details.

At the time represented by the 1508 window, the areas of glass have become much larger, colors are more literal, weaker. The mosaic quality of shapes, and naive charm of line is gone. The lines of lead are concealed in the drawing of the subject matter wherever possible. This is why we get the feeling more of a picture than a window.

It was in using boldness of color and line that stained glass had spoken most effectively as a medium. The trend shown in the 1508 window continued into the Nineteenth and early Twentieth Century. It is in this later context that stained glass has been thought of as a lost art.



Arms and Armor Catalog

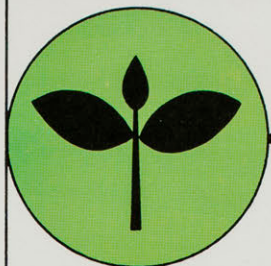
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Stimulants from Plant Sources



by **Dr. William A. Emboden, Jr.**
Research Associate in Botany,
Los Angeles County Museum of
Natural History and Associate
Professor of Biology,
San Fernando Valley State College

"Let us dream of evanescence, and
linger in the beautiful foolishness of
things."

Okakura-Kakuzo
The Book of Tea

"Excitantia" is the term which the toxicologist Lewin (1924) used to describe drugs which stimulate the nervous system. Some of these stimulants have been responsible for the development of entire civilizations, others have histories rooted in debauchery, plunder, and still others menace populations with the threat of disease. Many of us would find it difficult to make it through a day without one or more of these "analeptics." Indeed, our coffee break is one of the few rituals still widely practiced by Americans. Most stimulants are derived from botanical sources and have histories which are best classified in accord with their properties — "excitantia." A review of botanical sources of analeptics associated with major civilizations will reveal the ways in which man has employed these drugs.

Tea is first mentioned in the Chinese dictionary of Kuo P'o which appeared in 350 A.D. Earlier attributions are incorrect.¹ "Cha" was the name which was used then and is still used in China.

Although our first records are from China, tea grows as a native only in northern Thailand, East Burma, Assam, Yunnan, upper Indo-China and in parts of India. It may surprise some readers to find that tea is in the same genus as the popular horticultural **Camellia**. Formerly known as **Thea sinensis** (literally tea of China) it is properly called **Camellia thea**.

Under varying conditions of cultivation, tea leaves will develop distinctive flavors. Even leaves on the same plant vary in quality, and only immature leaves are suitable for use in choice tea. Buds and the few terminal leaves produce teas of a quality seldom encountered in domestic markets. An expert can distinguish over a hundred grades of tea

¹In a Confucian ode (Cir. 500 B.C.) there is an oblique reference to a beverage which might be construed as tea.

from this single species. Of course, the treatment which follows harvesting imparts much of the flavor. Black tea is the result of "withering" the leaves in sun and then crushing them slightly so that some of the cells are broken, releasing enzymes which will ferment the leaves and extract the tannins. At a critical moment in fermentation the leaves are "fired" at 200 degrees Fahrenheit to end the process. Green tea differs in that the fermentation is restricted. Oolong tea differs from the other two in being "withered" for only a brief time and being fired for but a few moments at 400 degrees Fahrenheit.

In addition to caffeine, which acts as a mild stimulant to the cerebral cortex, tea contains theophylline which causes dilation of the coronary artery which supplies the heart. These alkaloids in moderate doses pose no threat to the individual with normal metabolism, however there have been critics of this "addiction." Like most stimulants, the addiction is a psychological state; rather than having a physiological basis it is habituating. Since the per capita consumption of tea in England is over ten



Tea: In nature the plant grows as a tree 40 feet tall.

pounds annually, ten cups per day is not unusual. Tea contains about one and one half grains of caffeine per cup, about one half of the recommended medical dosage. In 1952 a medical member of the House of Commons spoke out against excesses in tea drinking. In his words, such individuals, "... pose before us as virtuous people, forgetting that they are the truest types of drug addicts." Given the American penchant for prohibition, it should surprise us that no such proposal has been introduced into our legislation.

Avicenna, the famous Arabian philosopher and physician (980-1037) was one of the first to write of coffee. For reason of this Arabian record, Linnaeus, the Swedish botanist of the 18th century, named the plant *Coffea arabica*. Evidence is rather conclusive that the home of coffee is Ethiopia. In 1601 Anthony Sherley introduced Kahveh into England and William Parry wrote of it using the contemporary spelling coffee which he originated. So popular was the beverage, that coffee houses spread rapidly throughout Europe and by 1689 even Boston had its "Café." Demands for the seed of *Coffea arabica* were so great that the world powers began to establish the plants in their colonies. Not until the 18th century did South America become a center of cultivation. Now two thirds of the world's supply of coffee comes from Sao Paulo, Brazil in the form of 132-pound bags; forty million such bags supply the world's annual requirements.

Berries of the coffee plant look much like cranberries and each fruit contains two seeds which when dried, aged, roasted, and ground, form the coffee of commerce. These seeds contain only about one per cent caffeine which, in the form of a cup of the brew, gives the weary a lift through a direct effect on the cortex of the brain. While numerous other sources of caffeine are available, Americans prefer coffee beans to the extent of 17 pounds annually for every man, woman, and child.

"Food of the Gods" was the description of cocoa that Doña Marina related to Cortes when he landed in the Yucatan peninsula in the year 1519. Having defeated the Maya Indians who inhabited the region, Cortes was given 19 girls as loot from this conquest; records indicate

that Cortes hardly considered them as treasures. Among them, however, was the beautiful princess Doña Marina who spoke both the language of the Mayans and that of the Aztecs. Having perfected her Spanish, Cortes used her as an interpreter during the subsequent Spanish conquest. It was through Doña Marina, who had by this time been mistress to Cortes and wife to one of his captains, that Cortes found the bitter beverage which was consumed only by Montezuma and his lords. Given the splendor of the riches taken from this Aztec king, Cortes was ready to believe almost anything; thus, when the aging Montezuma was seen drinking a concoction of raw cacao beans ground with red pepper and bitter herbs before going to a harem of beautiful women, Cortes was understandably curious. Doña Marina assured Cortes that the mixture drunk from a golden vessel was a potent aphrodisiac. Thousands of the small plants from which the cocoa was derived were ordered planted by Cortes so that Europe might know the joys residual in this tiny bean. Having gained the ultimate knowledge, Cortes dealt the Aztecs a final blow, the regicide of 1520.

Native to the Amazon Valley, the tree had been brought to Mexico centuries before the entry of Cortes. Seeds from the pulp of this large orange fruit were used by the Indians as coins before and after the conquest. In spite of the reputation of "Chocolatl" (the Aztec term) as an aphrodisiac, nuns in a cloister at Chiapas in 1550 discovered that when the powdered seed was mixed with vanilla and sugar a delicious beverage resulted. So popular was this drink that the ladies had their maids bring the brew to them to drink during mass at the cathedral. When the Bishop spoke out against this practice, the ladies, who maintained that chocolatl "overcomes weakness of the stomach," removed themselves to the cloister church to join the nuns in this harmless pastime. Actually there are no aphrodisiac properties, only a mild stimulation from the alkaloid theobromine which is almost identical to caffeine.

Linnaeus did not ignore the story of Montezuma, for when he christened the tree with the generic epithet *Theobroma*, he indicated in Greek the words of Doña Marina, "food of the gods." Each tree

bears thousands of tiny yellow flowers, not on the twigs, but arising directly from the trunk and older branches. Only a few dozen of these ever develop into the obovate fruits containing a pulpy white mucilage in which are to be found the cacao beans. After fermenting and cleaning the beans, which are about the size of our lima beans, they are roasted and the husk removed by crushing. Cocoa and chocolate are both derived from this crushed residue, the only difference being that cocoa results from the removal of most of the natural oil in the bean, whereas chocolate is the residue plus fortification through the addition of the oils extracted in cocoa manufacture. In both cases sugar is added and sometimes milk, arrowroot, etc. An innocent confection born out of conquest, myth, and plunder is produced from 800,000 tons of cacao beans annually. Most of the crop is produced in Nigeria and Ghana, but a substantial portion comes from Brazil. Until 1910 plantations in Venezuela, Ecuador, Brazil and Sao Thomé (off the coast of Africa) were run by forced labor. Since then, this crop, like coffee, has abetted the extensive proliferation of the civilization of these areas.

Almost as popular as coffee are our cola drinks, yet few of us think of them as stimulants. Native to tropical western Africa, *Cola nitida* has been introduced to various parts of the world for reason of the kola-nut which yields two percent caffeine by weight and has a pleasant flavor. Inside of the star-shaped fruits, which are about 10 cm. long, one finds eight reddish seeds. Natives of Africa and Jamaica chew the seeds of this tree fresh or boil them to form a beverage which inhibits fatigue and hunger. Nearly one hundred tons of these dried seeds are imported into the U.S. every year to be used primarily in cola drinks.

It would seem incomplete to make a reference to cola without its complement coca. Just as the African women slaves chewed kola nuts to relieve hunger and fatigue, Andean porters and guides chew the leaves of *Erythroxylon coca*. Coca is the only source of cocaine, a stimulant having an almost immediate action on the higher levels of the brain, giving the user a sense of boundless energy and freedom from fatigue. It was one of the basic ingredients of Coca-Cola until 1904



Small stick for extracting the Lipta from the poporo.



1. Poporo of a youth.

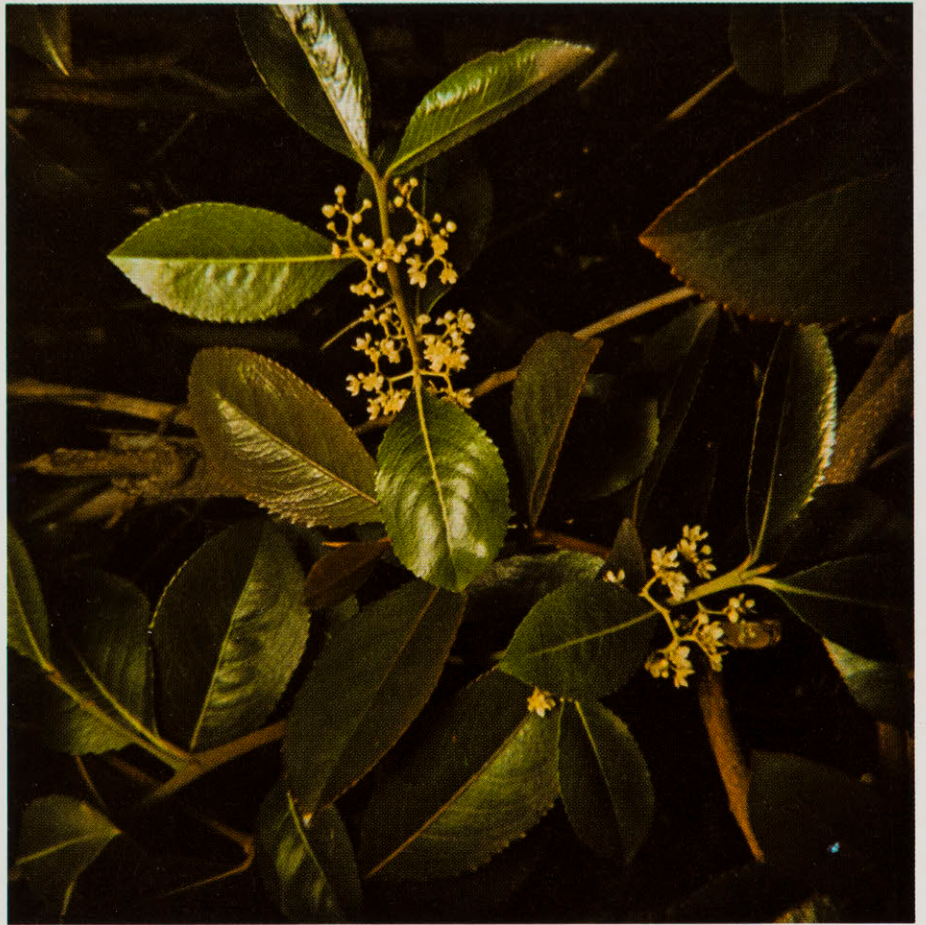


2. Poporo of a man in his prime.



3. Poporo of an old man.

Wood engraving of Poporos of a youth, a man in his prime and an old man. Note the increasing deposition of lime at the mouth of the gourd. (from Mariani)



Khat: In Yemen this has been consumed long before coffee was known.

when the courts ruled against its use. Centuries before Pizarro conquered Peru the coca leaves were being used. Grave sites indicate that the pattern of its use has not changed. Every mature Indian has a vicuña bag used to carry the dried leaves, a small block of lime (Ilipta) inside a gourd (popóro) and a stick for extracting the alkali from the gourd. To the wad of leaves being chewed, every so often a bit of lime is added; this facilitates extraction of cocaine which acts directly on the central nervous system to relieve the pangs of hunger and fatigue. In the two ounces of dried leaves that an Indian consumes in a day, there are approximately 0.7 grains of cocaine. Doses of this size are never fatal and are not addictive. In the 16th century the Spaniards were extracting gold from the Potosi mines by Inca slave labor relying upon coca to keep the workers going. In the 20th century the tradition persists in Bolivia where American mining is accomplished by laborers who, for reason of almost non-existent wages, must rely on coca.

An Italian physician, Angelo Mariani, amassed a fortune in the 19th century by adding coca to wine and selling it under the name "Vin Mariani," and in a more potent form as a liquor. Both were sold as anesthetics and analgesics with further claims as to their efficacy in curing stomatitis, gingivitis and gastric disturbances. The argument must have been convincing, for his customers included no less a person than Pope Leo XIII. In a de-alkalized form, coca is still used in some cola beverages. Of the 28 million pounds produced annually, most is consumed in South America.

In an Arabic manuscript of 1333, we find reference to a "tea" made from buds, twigs, and fresh leaves of a woody perennial, *Catha edulis*. Khat (quat, chat, tschat, tchai) is one of several popular names for the brew which predated coffee in Arabia by over 100 years. Native to northeastern Africa, Khat was introduced into Yemen when this country was dominated by Abyssinia before the 6th century and has since found favor throughout much of Africa.

An initial feeling of excitation and gaiety follows consumption of khat, after which a mildly hallucinogenic effect may be experienced. Like coca, it allows an individual to go without food for ex-

tended periods of time. Euphorants to be found in khat include dexedrine, ephedrine, and pervitin. Ephedrine, by the way, is the alkaloid which is predominant in our desert shrub *Ephedra* which was so popular with the early Mormons as the basis for a tea. Adverse symptoms often followed a prolonged consumption of khat, for the overstimulation of the heart results in various cardiac diseases. In Yemen, where khat enjoys its greatest popularity, there are great numbers of bachelors, for this drug reduces the sexual drive to almost nil. Drinking and chewing khat is a social pastime as important to many Africans as the western coffee break. Yemen and Aden tribes, who have warred for centuries, retire every evening for their khat ritual. So important a commodity is khat, that its daily export to Aden is the reason for the founding of the Ethiopian Airlines.

In the desolate interior of Australia, a lack of water and food limits the population to semi-nomadic tribes of aborigines who have learned to live under conditions which are minimal with respect to the necessities of life. These hardy people travel trails centuries old which meander through scrub vegetation in the interior of the continent. Commonly called "pituri roads," they were named after the narcotic shrub for which reason the roads were blazed hundreds of years previously. Leaves of the pituri (*Dubosia hopwoodii* and a taller species *D. myoporoides*) when roasted, moistened and rolled into a "quid" have the capacity to ward off hunger, pain, and fatigue — elements common to these tribes living under duress. It is supposed that numerous alkaloids are common in these leaves, but the prominent one is scopolamine, an alkaloid which is extremely toxic in large doses. Game animals are captured by the natives by pituri poisoning waterholes where the animals regularly drink.

Pituri is an item of common barter with those tribes who do not live in areas where the plant grows; it is known to these people under twenty different names. Not only do they chew the sausage-like quid, followed by swallowing the residue, but since the introduction of Europeans to Australia it has also been smoked. Although the poisoned dreams of pituri represent a brush with

Coffee: The seed dried, roasted, and ground is the great American brew.





Pituri: Leaves of **Dubosia** are an aboriginal stimulant.

death, it is preferred to the sting of a harsh reality.

One of the most popular stimulants since ancient times has been the seed of a palm, **Areca catechu** which goes under the popular name betel. To the peoples of southern Asia and the islands of the Indian and Pacific Oceans, betel is as important as tobacco is to our culture. A bit of leaf from the vine **Piper betel**, and a piece of lime is usually mixed with the slice of **Areca**. Asiatic cultures vary the ingredients to include cloves, tamarind, turmeric, tobacco, cardamon and resins. Arecoline is the alkaloid which may act as a very mild stimulant and powerful masticatory (the chewing is accompanied by regular squirts of red saliva). Although the spitting is a menace to health, the arecoline that is swallowed does help rid these people of some internal parasites.

Betel palms produce about 250 seeds or nuts per year and millions of these trees are under cultivation. Frequent use of betel results in an accretion of a lime and pigment residue that causes monstrous black teeth to protrude from between the lips of those who have for a long time been habituated to betel. This condition is such a mark of distinction that in some islands cultures it brings one to the highest social stratum. For reason of its astringent properties, betel will probably never enjoy any popularity outside of its present distribution.

Numerous other stimulants are used by people of the world for similar reasons. Societies deficient in food resort to narcotics which will alleviate the pangs of hunger and concomitant fatigue; where food is plentiful, the fatigue which is the result of boredom or disenchantment is mitigated by similar antidotes. Tobacco and alcohol have been purposefully omitted from consideration, for neither are true stimulants; they are better considered as a nerve poison and an inebriant respectively.

In all cultures, the quest for altered states of consciousness persists and has since the emergence of civilization. Perhaps it is a distinguishing characteristic of civilization that man wishes to govern his states of consciousness as strongly as he desires to govern his physical powers, if only to spend a few moments "lingering in the beautiful foolishness of things."



Coca: A wad of leaves, when chewed, stays hunger and sleep.



Kola: The exposed seed is a popular flavoring for beverages.



Wood engraving of natives of Colombia chewing coca. (from Mariani)



Cacao: It is the fermented seed that is the cocoa and chocolate of commerce.



Betel: To Asiatics betel is as important as tobacco is to Westerners.

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The Kachina cult is an ancient part of the culture of the Pueblo Indian people of Arizona and New Mexico. These people are essentially agricultural and practice an old and unchanged method of dry farming which, of necessity, is dependent on the relatively sparse rainfall. The Kachina cult, primarily associated with rain-making, is therefore an important part of Pueblo religious expression, for the rituals attached to it are deeply connected with the subsistence patterns of their agriculture.

It seems strange then that earlier opinions about the Kachina cult linked it with Spanish and Christian origins, claiming that Kachina deities and masks derived from saint lore. With its definitely aboriginal concern, dry farming, the Kachina cult has associations so Pueb-

loan that Spanish origins seem most unlikely.

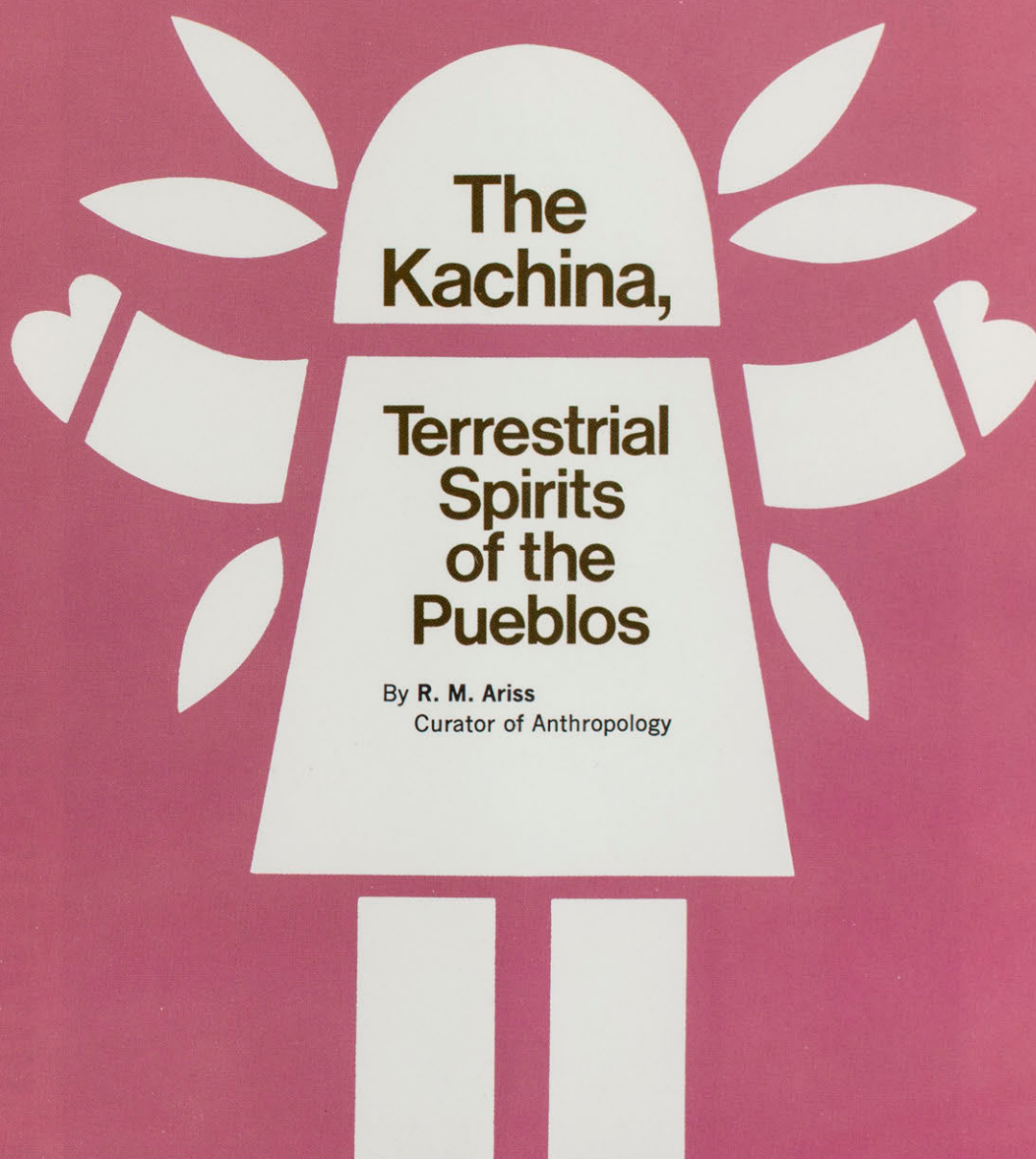
In addition, Spanish churchmen displayed determined resistance toward Kachina secret society activities because they felt the cult was a heathen expression. Both Pueblo sorcery and Kachina cult were considered to be the work of the Devil. Consequently, crusading Spanish churchmen burned Pueblo ritual paraphernalia whenever possible.

Outside influences did creep into the Kachina cult, however. European-introduced domestic animals appear, as witnessed by Horse Kachina, Cow Kachina and Sheep Kachina.

But, oddly, clear-cut evidence of Mexican influence is lacking. Pueblo Kachina masks, conventionalized and symbolic in their treatment, have little

in common with realistically modelled and painted Mexican masks. The complex pageantry of the Kachina cult is suggestive of Mexican practices, but a specific Mexican homologue has not been outlined as yet.

Archeological evidence has been found which links the Kachina masked cult to pre-Spanish sites, thus establishing its autochthonous nature. From the Double Butte Cave in the Gila Basin, Dr. Emil Haury reported a carved prayer stick in the form of a masked figure which anticipates Kachina doll developments. According to F. J. Dockstedder this cave find serves to validate a Hopi legend that the Kachina came to the Hopi from the Casa Grande area. The date of the cave deposit has as yet to be definitely established.



At Awátovi, adjacent to the Hopi villages, a series of murals depict masked figures resembling Pókoma, a being associated with domestic animals, and Kókopolo Kachina, a humpbacked figure who mimics sexual intercourse with women spectators at the Hopi Kachina ceremonies. Another Awátovi mural shows a masked figure similar to Wüwüyomo, Badger Clan Kachina (See figure 1, Wüwüyomo, painted by Chizomana). The murals are located in a kiva (ceremonial chamber) that was filled prior to the 1629 construction of the church of San Bernardo de Aguátubi. The founding of Awátovi is dated at 1332 A.D. The murals, done after 1332 and before 1629, reflect no Spanish influence and afford further proof of the indigenous origin of the Kachina cult.

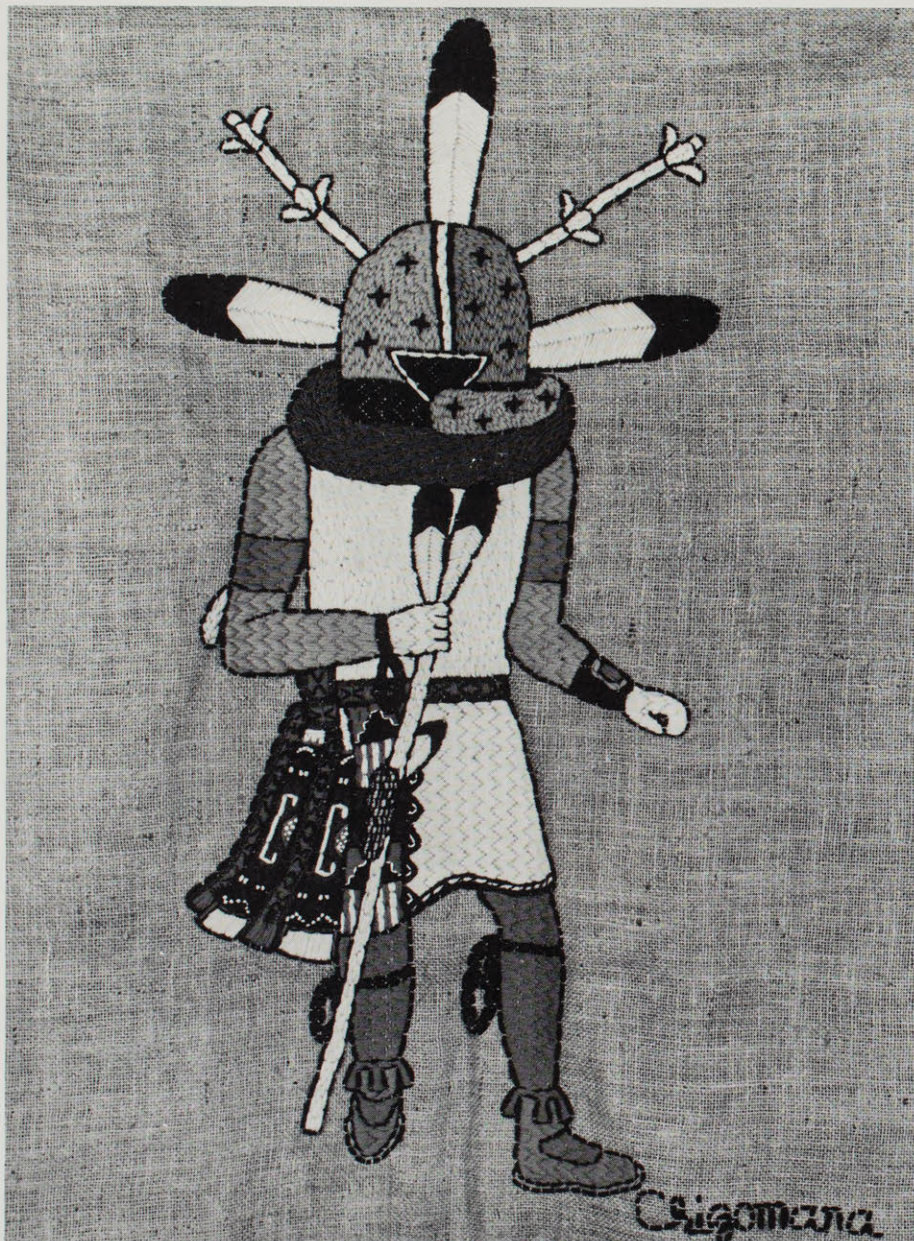
A great number of pictographs (rock drawings) in Arizona, New Mexico, Utah and Texas depict masked beings suggestive of Kachina figures. Dating is difficult to establish but the rock drawings indicate the wide distribution of masked figures in the Southwest.

Historic sources also yield documentary evidence of early Kachina cult activity. Antonio de Espejo, on a 1582 exploration of the Southwest, saw masked dancing. Diego Pérez de Luxán of the Espejo expedition recorded that: "Throughout this nation they have many masks which they use in their dances and ceremonies."

Kachina Cult manifestations came into prominence in the middle 1660's in New Mexico as a result of church-state conflict in the Spanish colonial regime.

Open hostilities between church and state broke out when Governor Bernardo López Mendizabal sought to undermine the power of the church by encouraging the Indian masked ceremonies so hateful to the churchmen. A Spanish Colonial law forbade the practice of idolatry and drastic action had previously been taken on such charges. The Indians found themselves between these two institutional forces of Spanish culture and became so embittered by Catholic extirpation practices that they revolted violently in 1680.

The burden of proof was upon the religious officials to show that the Indian ceremonies, especially the *catzinas*, were superstition. Governor López ordered the Tewa Indians to present their dances in the Plaza at Santa Fé. López stated that



Chizomana is the creator of a series of embroidered depictions of Hopi Indians subjects in colored yarns on colored burlap backgrounds. Her work has been on exhibit at Los Angeles County Museum of Natural History since June, 1966. Chizomana lives at Oxnard, California with her husband Fred Ishii and their three Hopi children.

Figure 1
Wüwüyomo

the dances were not evil but merely Indian nonsense and that he himself would have liked to have participated in them. It was reported that a Captain Aguilar had "danced **catzina**."

The encouragement of Kachina dancing by López led to increased reprisals by the churchmen. The Governor was brought to trial but died in jail before he had been sentenced. The victory for the Church was followed by raids on Indian cult areas in which over 1600 masks, figurines and prayer sticks were seized. At Isleta alone (south of Albuquerque) twelve "diabolical masks" were confiscated. Such tactics increased the secretiveness and resentment of the Pueblos.

In 1680 a Pueblo revolt broke out from Taos to the Hopi Pueblos defeat-

ing the hated Spanish and forcing them to abandon the Pueblo area until their re-conquest in 1692.

After Mexican Independence in 1820 religious conflicts between Hopi and Spanish-Mexican culture abated somewhat. After 1848 the Pueblos fell under Anglo-American jurisdiction. A few Anglo-Americans such as Voth, Stephen, Fewkes and Cushing were able to establish high rapport with the Hopi and Zuñi in the western part of the Pueblo area, but as more and more "Bahana" (Anglo-American people) came into contact with the Pueblos the Indians restricted them from attending Pueblo ceremonials. The public part of the Pueblo ceremonials can be witnessed today at Hopi and Zuñi in the western area, but among the eastern, or Rio

Grande Pueblos, the Kachina ceremonials are strictly private affairs.

The etymology of the word "kachina" is from the Shoshonean Hopi **kachi**, life, and **na**, "father." Another Hopi meaning of **kachi** is "sitting" or "reclining" as though to listen to requests.

The Kachina Cult among the Pueblos consists of a group of spirits who emerged from the underworld with the Indians or joined them in their later wanderings, according to various Pueblo mythologies. The point of emergence, said to be the north, is designated **shipapo** or **shipapu** and is symbolized both in pre-Spanish and present day ceremonial chambers by a hole in the floor. After emergence and in the company of the Kachina spirits, the Pueblos (especially Hopi, Keres, Zuñi, Jémez, San



Figure 2
(Mana) Crow
Wing Mother

Juan and Isleta) moved to the east or south and built houses (settlements?), then moved on in search of the center of the world ("middle place") which is synonymous with the particular village in which each Pueblo people now live, and wherein it is "destined to live forever."

Often the mythology indicates that a quarrel between the Pueblos and the Kachina spirits resulted in the departure of the latter. A reconciliation was effected, after which the Kachina, as impersonated by the villagers, stayed only part of the year at the Pueblo, returning to their abode to the west.

The Kachina are not worshipped as gods, nor are they said to live in a celestial abode. Perhaps the term "ter-

restrial spirit" applies to them as well as any other designation. The spirits of deceased Pueblos are believed to become Kachina in some instances. Feminine Kachina figures (Kachinmana) are thought to be relatives or sweethearts of the male figures, as in Figure 2, the black and white photo, "Crow wing mother" by Chizómana.

There is a material phase present in the masks, costumes and dolls (Kachintihu) which aids in visualizing the cult, but more important to the Hopi are the spiritual aspects. Neither the paraphernalia nor the impersonators are considered sacred, but the spirit of the Kachina is expressed through the psyche of the Pueblo impersonator. The Kachina are, however, charged with spiritual power (tabu) and are dangerous for humans to

touch.

The Kachina, as spirits, are associated with various life conditions and functions; they are also associated with animals (as in figure 3, Eagle Kachina, color plate) and are often identified by their characteristic utterances. The Kachina are depicted in a way that is symbolic rather than realistic. The Kachina figures are generally benevolent, although some are considered dangerous and punitive (Figure 4, ogre by Chizómana and figure 5, Male ogre, color plate) Children are disciplined by means of the Kachina and village interests are defended by them against foreign influences.

The Kachina carvings (**kachintihu**) afford the easiest way to appreciate the diversity of the cult, as there are many



Figure 3
Eagle Kachina
Hopi

more Kachina than are seen in the annual round of the ceremonials. (See figure 6, Female ogre Kachina, color plate). Dockstader lists at least 335 Kachina about which he has information. At Hopi, Kachina dancing starts with Powamu, Bean Festival, in February and ends usually in July with Nimán, (Going Home Dance). The Hopi have other important ceremonies which do not involve masked figures such as Snake Dance and Flute Dance, so the Kachina ceremonies are merely one dramatic phase of the annual religious calendar.

The Kachina cult serves to unite the Pueblos in several ways. As a secret society, all young persons are taught Pueblo religious lore and become full-fledged members of the adult community as a consequence of initiation. The Kachina

are believed to provide rainfall and also fertility in plants and animals, another important way in which they work for Pueblo well-being. In turn, the ceremonies are performed to please the Kachina so that Pueblo requests will be granted. The dances, to be effective, require perfect execution. Participants must forego eating meat, grease and salt and refrain from sexual intercourse until the ceremony is completed. As well as being serious and meticulous dancers, some of the figures perform as clowns to afford comic relief through mimicry of the other participants; they may simulate reproduction to assure fertility of plants and animals. Such a figure is the "mud head," Táchükti, (Hopi) or Koyemshi, (Zuñi) whose earth-colored, painted body symbolizes the soil (Figure

7, Koyemshi, "mud head" Kachina, color plate). Spherical protruberances on his mask are filled with seeds which will grow magically as a result of the fertility mimicry of this Kachina.

The principal part of the Kachina costume is the mask which may be made of leather, basketry or felt. Feathers and carved wooden features may be added and most mask surfaces are painted for symbolic or artistic purposes. Body painting is common and objects are carried in the hands of the dancers, chiefly rattles, wands, agricultural products or feathers. A woven kilt is worn, often with a ceremonial sash at the side and a fox skin hanging at the back. Turtle shell rattles are tied at the back of the leg near the knee and a length of dyed yarn is suspended from each knee. Buckskin

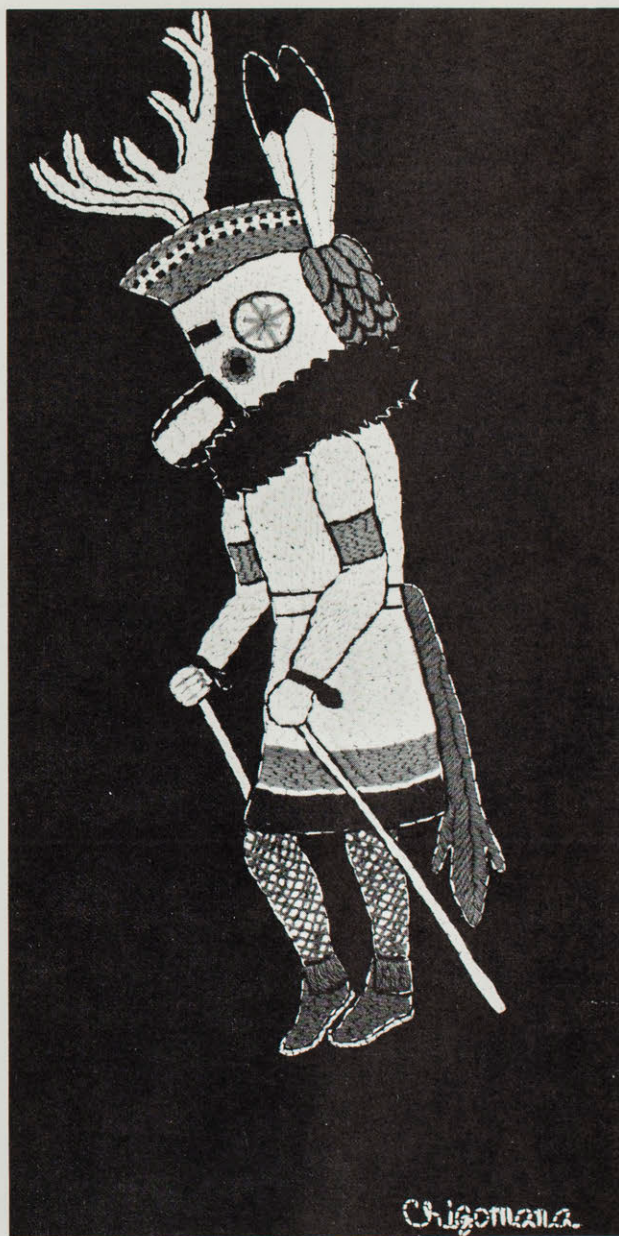


Figure 4
Deer Kachina
Hopi

moccasins reaching above the ankle, or sometimes to the knee, complete the usual dance costume.

In August, 1967, the author witnessed two Kachina ceremonies. One of them, the Hopi Nimán ("Home") dance was seen at Shipaulovi, on the second of the Hopi Mesas in northeastern Arizona. This is the final Kachina dance in the Hopi annual ceremonial cycle at Shipaulovi.

Dancing had begun at dawn in the main plaza, surrounded on all sides by plastered adobe houses. The Kachina performing this Nimán ceremony was Hümis (Jémez). (See Figure 8, Hümis Kachina by Chizomana). There were about twenty performers in the line who sang their own accompaniment and marked rhythm with gourd rattles held in the right hand. In the other each held a sprig of evergreen leaves. At the waist

was the Hopi symbol of friendship, an interlocking pair of "U-shaped elements" painted on the skin.

A very old ceremonialist called cadence at regular intervals as the dancers vocalized as they rotated. The Town Chief was the other dance leader, circling the dance line, sprinkling corn meal on the dancers as purification ritual and correcting any costume disarray. The Town Chief wore a downy feather on the top of his head; his torso was bare except for turquoise and shell necklaces. He wore a woven cotton kilt from waist to knees, his legs were bare and so were his feet. In the afternoon he added a pair of moccasins. The day was hot and the sandstone surface was abrasive, so footgear became advisable.

Five Hümis Kachinmana (women dancers) formed a parallel line in the

dance. One of them brought a notched stick and shoulder blade scraper for added music. The Hümis Kachinmana figures formed a half-circle around the musician and echoed her rasping sound which represents the croaking of frogs in the rain.

Offerings of corn, watermelons, fresh fruit, bread and toys were brought to the plaza during the day. In the late afternoon the presents were distributed by the dancers. The dance rounds lasted about thirty minutes each, after which the group would leave the main plaza and dance in a smaller one under a different leader. The last round of dancing ended at dusk.

What a contrast was the other Kachina ceremony! It took place the next day at Hano on the Hopi First Mesa. The Kachina performing was Tásap (Navajo).



Figure 5
Male Ogre

Figure 6
Female Ogre

(See Figure 9, Tásap Kachina, and Hano style clown by Chizómana). The dance group had some twenty-five male dancers with five or six younger dancers, probably learners, in the back of the dance line.

A white feather crest was worn at the top of the Tásap mask. Each dancer carried a gourd rattle in the right hand, and in the left, a wooden wand, painted white. Each dancer wore a small leather bag, bandoleer-style, suspended from a diagonal strap that crossed the torso left to right. The kilts worn showed much acculturation, and were highly variable, many were patterned after Chinese silk shawls with fringed ends; other kilts were of blanket fragments of Chimayó (New Mexico Mexican) weave or Anglo-American factory-woven textiles.

A chorus of ten masked and costumed male figures sang for the dancers. Most of the chorus were dressed as "Navajos" in brightly colored shirts and white or dark trousers. Face masks were generally a white chalky color with hair, eyes and mouths indicated in black. One elaborate mask was modelled after the classic Greek tradition. One chorus member was clad in the blue dress uniform of a Navy enlisted man. The music was the robust Pueblo pattern occasionally interspersed with falsetto chanting of Navajo Yeibechai songs. They sang in a carefree, relaxed manner.

A trio of clowns was active during the three morning rounds of dancing. The main clown wore a false pate and had a red and black angular painted area about his mouth. His costume was like a circus clown's, cotton, with two

different prints sewn together as halves. The two minor clowns wore short denim pants, plain shirts and beanie caps. The principal clown made much humorous use of a pogo stick upon which he had ridden into the plaza. The other clowns tried to ride it and fell with much salacious comment about damage to groin and buttocks. Spectator children were brought into the pogo stick play.

The performance of the Tásap Kachina group was precise and dignified, but the chorus and clown activities lent a carnival air to this ceremony.

The Navajo Kachina, like Hümis Kachina, is from a non-Hopi source. As previously noted, the restraint of the first was in great contrast to the liveliness of the second. The Navajo were traditional enemies of the Pueblos in pre-Spanish days and there still exists a



Figure 7
Mudhead

remnant of antagonism between the two cultures. The burlesque of the Navajo could be sensed in this dance at Hano. Also, Hano served as a refuge for Rio Grande fugitives from New Mexico after the 1680 revolt. This accounts for the differences in the form of the Hano ceremony, in particular the chorus and drummer.

The Kachina Cult is an interesting and colorful Pueblo religious experience and

illustrates, in its alterations, the maintenance of a cultural tradition in spite of adverse climatic and culture-conflict conditions. Pueblo culture demonstrates the survival of ancient mores through persistent effort in a natural environment where, from the start, making a living was difficult. Pueblos manifest a determination to retain their way of life, although beleaguered by alien peoples who have appropriated their homelands.

While the culmination of the Pueblo culture was in the 1200's, there remains today, even with its diminished expression, a firm determination to continue Pueblo values within a framework of peacefulness and with trust in the support of their terrestrial spirits. In the current strife-torn world, the Pueblo example offers a contrast pattern whose values stress cooperation, productivity and peacefulness.

Figure 8 Humis Kachina Shipaulovi

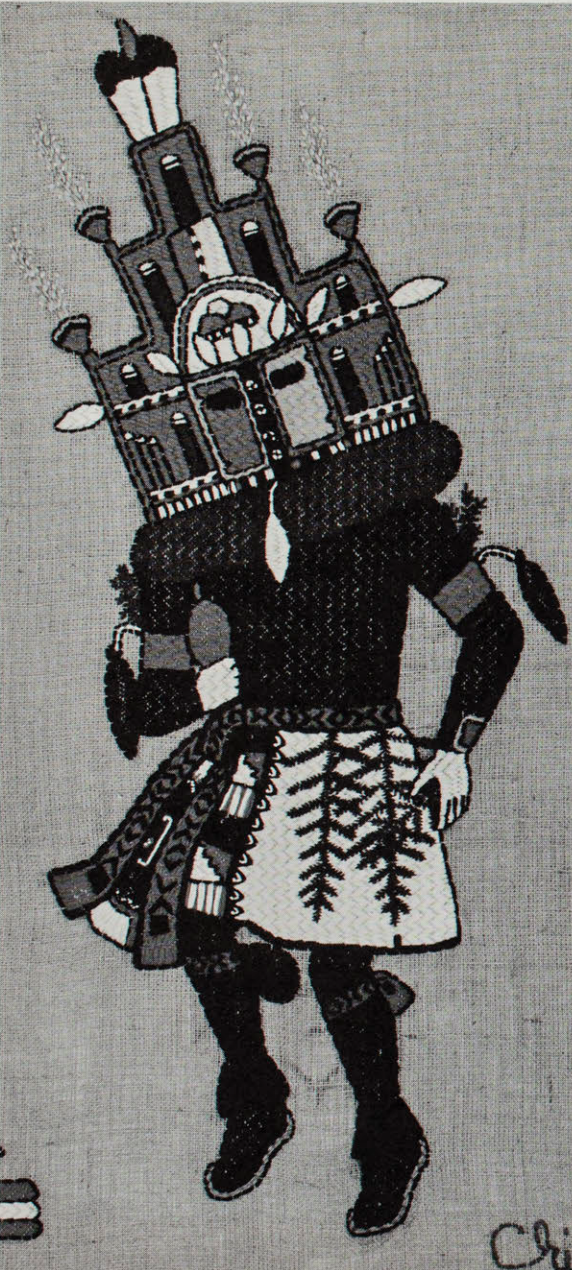


Figure 9 Tásap (Navajo Kachina) Hano Style Clown



The following text is a transcript of a tape recording of a conversation between Mr. Robert E. Wade, Chief of the Exhibitions Division and the four Museum Model Makers: Mr. Jack Alexander, Mr. Carl Gage, Mr. Verby Hicks, and Mr. James Honey.

R. Wade: There is perhaps no other single item on display in the Museum that captures the interest and imagination of the young visitor than the diorama models portraying historical events. However, Museum model making is in no way limited to the miniature dioramas. In many instances models are the only way that certain types of specimens can be exhibited such as soft bodied sea life; like jelly fish or sea hares.

Museum model making can be divided into several categories: Miniature dioramas, Biological models (both natural size and enlargements), Biological reproductions, Botanical models.

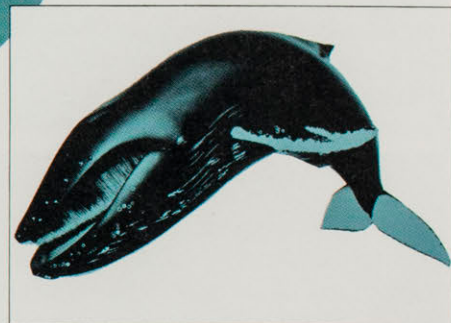
Because most of the models must be scientifically accurate; that is, if the specimen is transparent so is the model; if the specimen has down or scales, so should the model; the job is complicated by the fact that the model maker has to duplicate a living organism using a media that will be inert but will duplicate the color, texture, and living quality of the live specimen. If the specimen is microscopic, the model maker's problem is compounded because he has to duplicate a microscopic image many times its natural size in materials that will appear to be the same texture only enlarged.

Many of the models can be made directly from the actual specimen by casting in a variety of methods. Of all the kinds of Museum models that are produced in the model shop, I think the one that provides the greatest challenge and therefore the most enjoyment

to build are the historical dioramas. Here in a miniature world the model maker can call upon his ingenuity to create a scene, and capture a particular event and the spirit of the time. Some of the problems that come up in model making of this type we will take up at this moment. Jack, what are some of the things that you've run across in your experience with your diorama making?

Jack Alexander: Well, I would rather not deal in specifics yet, but I would like to discuss general information we need to design exhibit material. First of all, we need to know whether it's an interior or exterior scene, the orientation, the weather conditions, the time of year and the ecology conditions surrounding this event that we are trying to portray. We would need to know the number of figures required. Ethnic type descriptions would be helpful.

Museum Model Making



Scale Model of Humpback Whale (*Megaptera novaeangliae*). Note the highly detailed mouth showing the baleen formed with thin brass sheet and chicken feathers.
Model Maker: Verby D. Hicks

We would need to know the special kinds of food that they used and their methods of preparing or utilizing such natural foods as was available to them. And the bearing of their ecology on their general health. We need to know the architectural types of furniture and household utensils and things of that nature. And things of special importance are things which were so commonplace that they didn't last historically; which requires a great deal of research because they sank into oblivion with scarcely a ripple.

With the above mentioned set of conditions at hand, it is then up to the model maker to use his ingenuity to forage around and find the materials either natural or synthetic, which best fills the bill.

You may well believe that some of the materials are exotic. Space age plastics, chicken feathers, cactus spines; now everybody can get into this and toss in some of the exotic materials they used.

R. Wade: Mr. Gage, what are some of the biological model problems you've run across?

Carl Gage: The process for making models is sometimes rather bizarre on casual observation. Devices, tools, materials, some common, some unique, are necessary; and though they may seem outlandish they can be the solutions for acquiring a particular shape, texture, or appearance. One device I used when first delving into a new technique for casting plastic sea anemones, was an egg beater type of hand drill on which I mounted a wooden disc and used as a centrifuge for forcing plastic into all the voids of the mold. Needless to say, this use of a hand drill drew many interesting comments.

I found that a board with many different sizes of holes drilled in it, is just the ticket for making bubbles for the surface of the water in the tide pool diorama in the Marine Hall. The board is used as a mold with sheets of acetate vacuumed-formed over it; resulting in sheets of bubbles. A modified grease gun makes a perfect tool for squirting out long, thin strips of green vinyl for use as eel grass. There are several other things; a cake decorator gun was used to inject hot wax into the empty bodies

of goose-neck barnacles. Sabel antelope hairs match the long hairs of an urticating caterpillar and cactus spines for the setae on an enlarged flea model. Certain fabrics used in women's underwear make excellent compound eyes for insects! I found that the steam from a pressure cooker can be used to shape the plastic tentacles of a sea anemone and an electric deep fryer for melting wax.

R. Wade: Sounds as if you spend most of your time in the kitchen!

C. Gage: Since "necessity is the mother of invention" we will continue, until the computer catches up to us, to seek better ways of making better models with which to share observations of the wealth of information around us.

R. Wade: I don't think the computer is ever going to take the place of imagination. I think this is the forte that you people have that will keep the computer out of your jobs.

C. Gage: I hope so.

R. Wade: Mr. Hicks, perhaps you, as one of the newer members of the group can tell us some of your experiences in your former job and some of the things you have run across here.

Verby Hicks: Well, Bob, my basic experience was obtained by serving as an apprentice under the curator of exhibits at Louisiana State University Museum. There I learned taxidermy, model sculpture, model making, artificial plant preparation, and installation of habitat groups. This basic knowledge was applied to plastics here upon obtaining a position as Senior Preparator and later on as Model Maker. One of my best contributions I feel to the Museum is a neoprene latex casting system which I perfected and which is now being used extensively in fish and plant reproduction. A good example of this technique is a cast of the coelacanth which is on display outside the Marine Hall. Many problems are encountered in model making and in working with plastics. The walrus group which was recently completed, has approximately 140 sq. feet of artificial plastic water. While making this water, I had originally intended to use

a sheet of vacuum-formed plastic as the mold and remove this plastic when the process was completed. However, I found that a permanent bond was created between the two types of plastics, and this actually improved the appearance of the artificial water. And I think that this is a good example of turning a potential disadvantage into an advantage which we often run into.

Jimson weed, cocoa beans, and tide pool fishes are only a few of the models I have made during my four years here. I am currently engaged in the production of 50,000 artificial cottonwood leaves and an artificial plastic stream for the Bison group. I would like to say that model making is a very satisfying occupation; I feel that most of my associates gravitated into model making because they like to work and I would certainly recommend it to any young person who might be coming into the field.

R. Wade: Jim Honey, we haven't heard from you and I think you have some unique points on your past experience particularly in embedding which is a technique used in the Museum field. Would you like to discuss something about that along with your model making — some of the flowers that you have made?

Jim Honey: Yes Bob, I think I am the senior man in this group, the oldest one, and my past experience has also been very varied and in the beginning very difficult; because in my time there were no facilities to learn these things. My best training was acquired at Wards Natural Sciences where I learned the technique of plastic embedding. This is a very good method to preserve the specimens that cannot be preserved in dry form. In this way they don't have to be preserved in liquid. I think this technique has improved the facilities for exhibiting these specimens. From there on Bob, the making of models has been well described by the model makers that preceded me, and as I said before, the methods and materials we had to use were scarce and very primitive; mostly wax. Nowadays we use plastics and latex. I don't think I can add very much in the line of materials we use because it has been covered already.

R. Wade: Well, I think you could discuss your experience in the freeze-drying technique that you're working with too. This is an addition to model making, and you've been working along that line. Could you say a few words about that.

Jim Honey: Yes, of course. The thing we discussed before is to try to present in the exhibits whenever possible the real specimen instead of a model. In

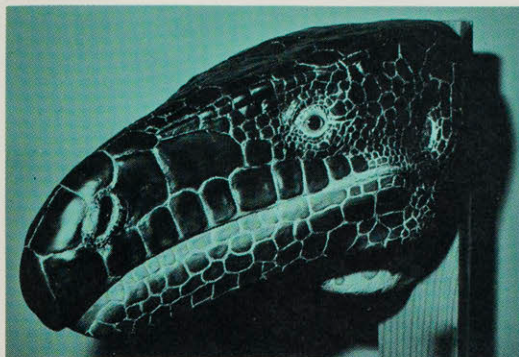
this freeze-dry method the specimens can be frozen very solid at a low temperature. Then the specimen is placed in a vacuum chamber and all the moisture that is contained in the tissues is sublimated out in the form of very tiny crystals. This technique gives us the opportunity to preserve the real specimen instead of making a model. But we are still experimenting with this tech-

nique.

R. Wade: About how long does it take to freeze dry let's say a mouse?

J. Honey: A full size adult mouse will take about 3 weeks to freeze dry.

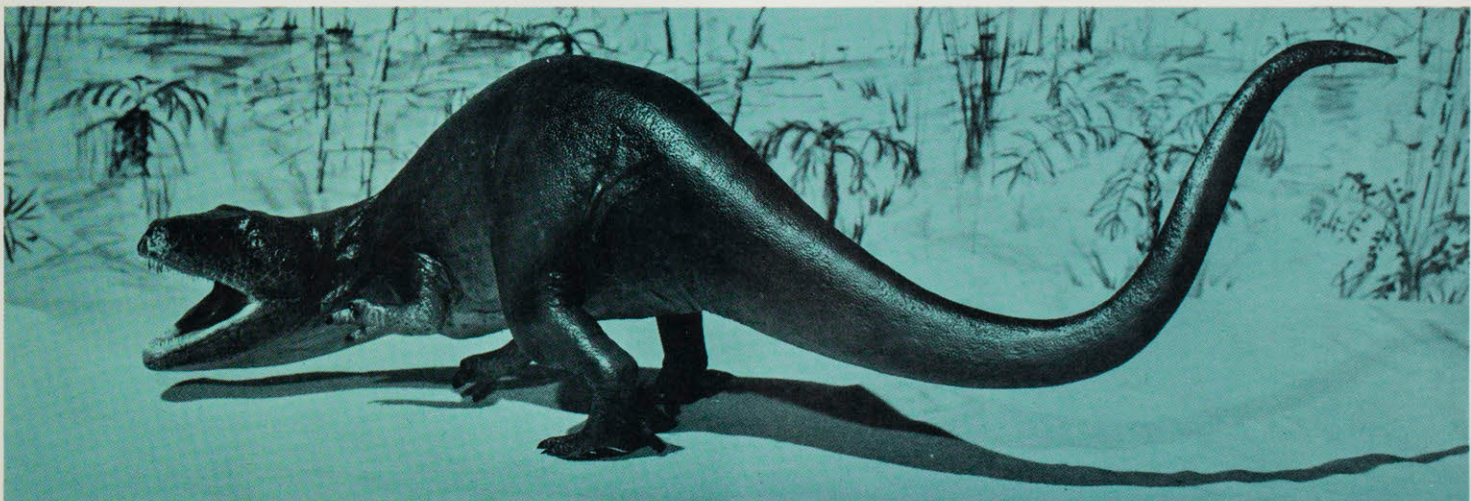
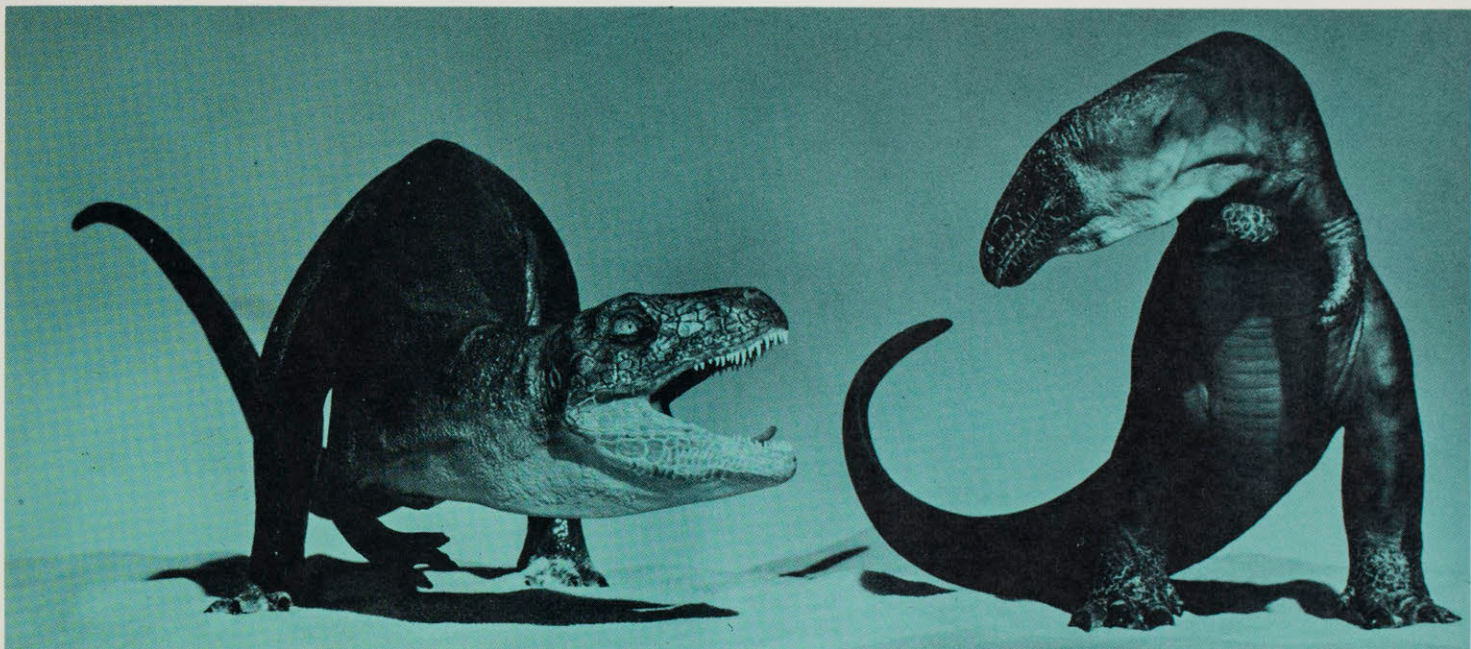
R. Wade: Thank you Jim. I'd like to get back to Jack Alexander now. Jack came to us from the outside industry and I think it would be interesting if Jack could tell us how he got into the model



Life size model (15" long) of the head of a **Camptosaurus**, one of the primitive Duckbill dinosaurs. Model was formed directly over a plaster cast of the original fossil skull. Model by Carl Gage

Scale models of Dinosaurs, the carnivorous **Antrodemus valens** attacking a **Camptosaurus**. Model by Carl Gage.

Scale model of the powerful carnivore **Antrodemus valens**. Model by Carl Gage.



making field, and why he is attracted by museum model making.

J. Alexander: Since I was raised by my grandfather who was the town tinker, I at an early age acquired a taste for finding out what made things tick and a proclivity for collecting string and use-less bits of information.

I first became interested in museum work back in the early thirties when I had the pleasure (?) of managing a small museum which was maintained at my high school.

The collection consisted mostly of rocks, bones, arrowheads, Indian moccasins, smelly buck skin vests and a miscellany of beat up old fire arms, edged weapons, utensils and tools which were significant to the development of a pioneering country such as ours was during the era of westward movement. On graduation from high school and a hitch in the C.C.C., I journeyed to Chicago to what was then the Field Museum; to inquire into the possibility of employment. I found that if the applicants were laid end to end, that they would probably reach to Peoria.

After working at various alphabet jobs; C.C.C., R.E.A., W.P.A., etc. I found birth as an apprentice pattern maker.

In the next twenty-six years I worked in experimental and research and development departments of several corporations and later in a number of job shops. In 1962 I reached the conclusion that I had about had it with making patterns and duplicator models. I started to look around for some type of work where I could readily transfer skills I had acquired; the answer was model making. In that same year I went to work at one of the major companies in the Aero Space industry as a model maker. There was something about making models of space ships and associated hardware that didn't give me quite the aesthetic satisfaction I was seeking. So I made application to the L. A. County Museum of Natural History. There I met Mr. Wade who told me that the line there was only two years long.

In 1965 I came to work at the Museum. Now I find I have completed the circle I had started twenty-nine years ago at the Field Museum. I was back at a museum; the only difference being I was now at the other end of the waiting line. My motivation for seeking employ-

ment in a museum was probably the fact that we are living in a highly technological culture and most of our products reflect very little of the hand crafts and skills, and are endowed with a built-in obsolescence. I felt that I would like to make something in my time that would be preserved and that this is one of the functions of a museum. And more important, these old crafts and skills should be preserved and presented as a challenge to future generations.

The foregoing has coloured my approach to model making in that often times, especially on historical subjects, I find myself doing things "the hard way," because my research has shown me that, this is the manner in which the originals were made; so that in effect, I try to capture the spirit of the thing as well as the form.

R. Wade: Well, I think this is a good point to bring out. You make your model such as you've done with your armor. You have to reproduce the hammer marks, the type, the texture, and the only way you can do it many times is to do it the way it was originally done.

I would like to get back to Carl Gage now. I know that he has been making models for us since he was sixteen years old. How did you get started on model making?

C. Gage: Well I first would like to give my philosophy on model making a little bit. Model making to me is a sharing of the discoveries gleaned from intense observation and research by recreating these sometimes complex realities in a suitable material and in a scale which allows direct observation of the important characteristics of the biological specimen, habitat or historical specimen or event.

Now a small bit of my ancient history; as a boy, I was typically very curious and awed by nature and the fantastic array of plants and animals that exist. I collected as much of this as I could and treasured my cache as most young boys do. The collecting and study of insects gave me more of an insight into the abundance and intricacy of the creatures around us. At age seventeen, I happened to find an outlet for my yearning to share and portray my observations. I made an enlarged model of a locust for a school class. When I showed the mod-

el to Dr. Fred Truxal, entomologist here at the museum, it was highly appreciated and it then launched me into this rare field of museum model making.

R. Wade: Well, that is interesting Carl, because I remember seeing that locust when you brought it into the museum. As a matter of fact, I might tell you boys that it was a museum model that got me interested in the museum field. I don't know if you've seen the model of the gold dredge over in the State Museum but they have got an excellent diorama showing dredging gold up near Redding, California. There was some model smoke coming out of the smoke-stack; which completely enchanted me and I couldn't figure out what it was. And it was years later that I found out it was a thin wisp of steel wool they had used. But it was that model that got me really delighted in museums. And even brought about the fact that I as a child had a museum in my house.

Verby Hicks, how about your background getting into model making?

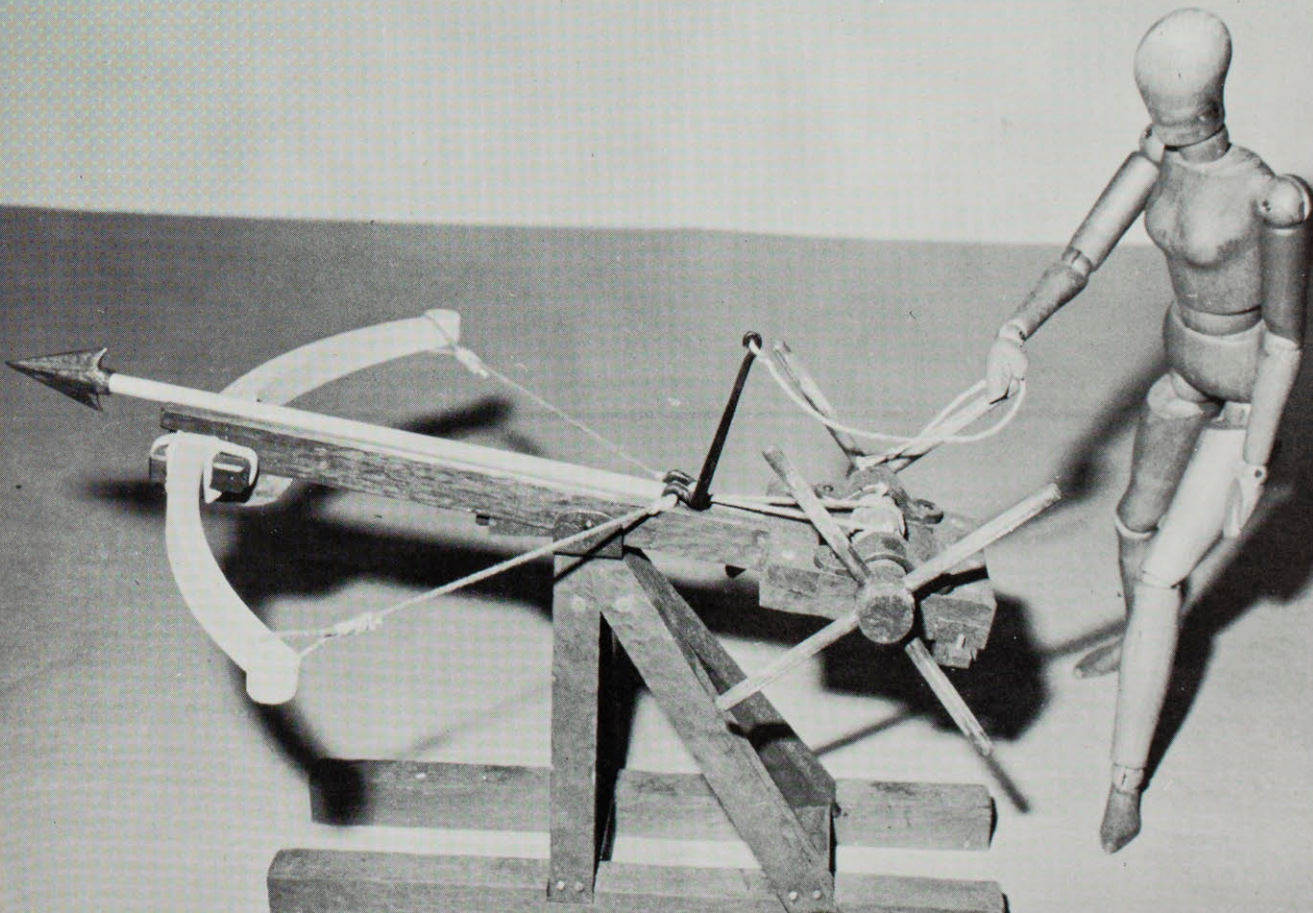
V. Hicks: Well, I am pretty much parallel with Carl. I was always interested in nature as a boy. From the time I was able to walk I was running around with jars; catching bees; and I was watching everything in nature and of course when I got a little bit older, living in Louisiana where there is a lot of wildlife, I was out hunting and fishing nearly all the time. After awhile it dawned on me that I should stop trying to kill everything or catch everything in sight and try to preserve some of it. So I got interested in taxidermy and when I graduated from high school then I obtained a small scholarship to Louisiana State University in Baton Rouge. This was quite an excursion for me as the school was 160 miles away from where I had lived and I had never been away from home before. I went off to college and I became exposed to the University Museum which was being built by Mr. P. Ambrose Daigre at that time who was formerly with the state museum in Shreveport, Louisiana. This was a golden opportunity for a boy because it's not often you can see an entire Natural History Museum go from the ground up; everything actually built and installed especially the dioramas. So this is where I got most of my really valuable training.

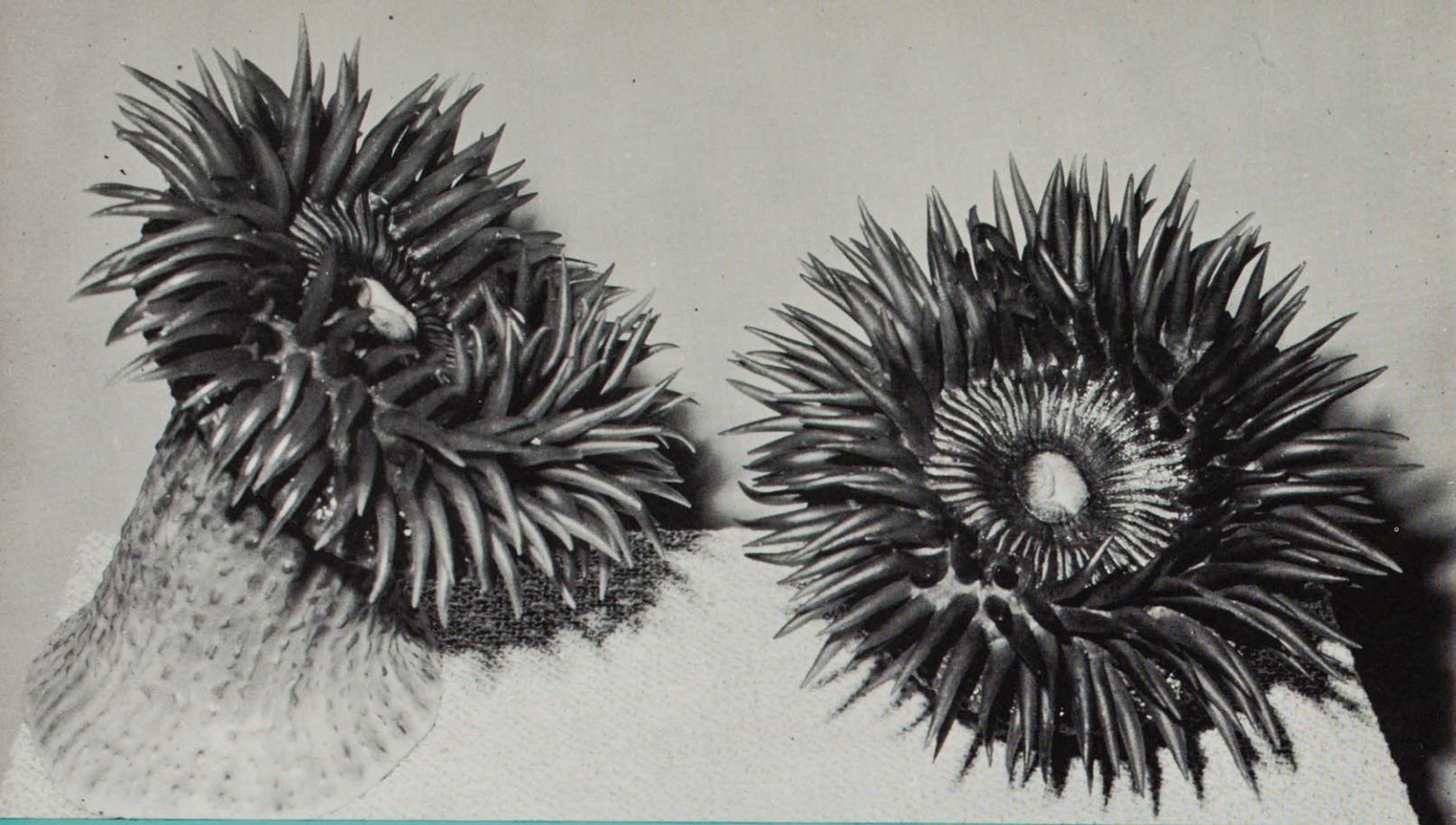
R. Wade: Thank you, Verby.



"BIFFA" or "TREBUCHET"—A giant sling equivalent to a heavy Howitzer in Medieval Artillery—13th to 16th Centuries—Scale 1" equals 1 ft. Model Maker: Jack Alexander

"BALLISTA"—A large cross bow—it could be considered to be a light field piece of medieval warfare—8th to 16th Centuries—Scale 3" equals 1 ft. Model Maker: Jack Alexander





Model Green Sea
Anemone (*Anthopleura*
xanthogrammica)
Natural size. Model
Maker: Carl Gage

Scale Model (15x) of Red Sea Anemone
(*Corynactis californica*)
with molds used for casting the tentacles,
oral disc and column. Molds are made of
metal filled epoxy, lead and silicone
rubber. The casting material is polyvinyl
chloride. Model Maker: Carl Gage





A preliminary step in the fabrication of a wharf pile for use in a diorama in the Life in the Sea exhibit hall now under construction. Natural rubber latex is brushed onto the pile to form a highly detailed flexible mold from which a light weight plaster and burlap cast is taken.

Wharf pile—sandy bottom diorama partially completed. Life in the Sea Exhibit Hall.





Wharf pile diorama showing the various plants and animals that inhabit this environment. Each specimen was either carefully preserved or cast as a plastic duplicate of the original organism. Model Makers: Carl Gage, James A. Honey, and Background Artist Larry Latta.

What has become of my Students

by **Gretchen Sibley**

Director, Museum Natural Science
Workshop, 1946 to the present.

Four of our present staff at the Museum were boys here, students in the Natural Science Workshop. All of them found careers here through the workshop; and two of them found romance that blossomed into matrimony.

Carl Gage walked into my office — a carved grasshopper in hand, an exact reproduction of the insect he had dissected in the Museum's entomology laboratory. It was beautifully construct-

ed, complete with every hair counted, and because it had been mounted with a pin he had even added the pinhole through the thorax!

This was in the spring of 1952 and marked the beginning of a successful career. As an outstanding high school science student, Carl had been chosen to attend the Museum Natural Science Workshop. He had come on Saturday mornings during the fall of the year, taking a lecture course to get a background in biology, and when he had completed that work, he took a class in laboratory and field techniques in entomology.

With incidents such as the beautifully carved grasshopper, Carl's unusual talent was quickly recognized at the Museum, and fortuitously he arrived while the Insect Hall was being planned. The natural upshot of this was that as he continued through high school and college, he was employed part-time to make models for the hall. It was then a natural development that when he finished college in 1962, he was added to the staff as model-maker in the Exhibitions department.

Carl has received great recognition for his talent. While still in high school, he won second place in the Southern California Science Fair with his collection of insect models. Since then he has received national recognition through magazine and newspaper articles. Carl has spent much time experimenting with new materials and processes and is now considered an authority in this country in model making and the use of new materials. The Insect Hall was his first work and he has assisted in a number of halls since that time. At present he is constructing models for the new Marine Hall.

While Carl was registering so well at the Museum, he also had an effect on a young lady in the Registrar's office. He married Myrna and they now live in Westchester.

That same spring, 1952, Dr. Kenneth Stager took the mammalogy class from the Natural Science Workshop out to the desert near Cabazon for a three-day field trip. When I arrived about two hours after the rest of the crowd, they had already been busily engaged and I was greeted heartily by three students. One waved a long black rubber boot, clutched together at the top, the other two had

cloth snake bags — all excited because they had found three rattlesnakes. So soon! — I had visions of three days in snake infested rocks with a group of ardent collectors. Luckily that was the end of the rattlesnakes and the rest of the collecting was less adventurous; but it was on this trip that I became better acquainted with one of the students, Jim Northern. Jim had an avid interest in birds and mammals and was turning into a fine field man. Dr. Stager had already recognized his fine qualities and trained him well to make him his assistant in helping with the class.

Jim found the Museum a second home. As he continued his studies at U.S.C. he was employed by the Museum and is now working in the Ornithology department with Dr. Stager. He has done extensive field work in Mexico, Costa Rica, Panama, Colombia, Ecuador, Alaska and Southern California. He has also been teaching the ornithology class in the Natural Science Workshop for several years. Carolyn Nigg, a school classmate of Jim's, was also on that Cabazon field trip; and in due course of time she and Jim were married.

Charles Hogue joined the Museum Workshop in 1951. His meticulous attention to detail was evident from the beginning and as he developed an intense interest in entomology he became a very fine student at the Museum. He continued his contact with the Museum throughout his college career at U.C.L.A. while completing his work on his Ph.D. He also assisted in teaching entomology and scientific illustration courses at U.C.L.A. He has been with the Museum as Curator of Entomology for several years now, taking the place of Dr. Fred Truxal, present chief of the Life Science Division.

Charles has done extensive field work in Southern California, Costa Rica and Kenya, East Africa with special interest in flies and related insects. Recently he has been made coordinator of exhibitions for the Life Science Division. Charles also teaches the Workshop course in entomology and helps with the scientific illustration class.

Dr. Richard Felger has recently returned to the Museum, switching his previous status as student to that of curator in charge of the Botany Department. In 1951 Dick was chosen to at-

tend the Natural Science Workshop from Fairfax High School and that was when I first met him. My chief remembrance of Dick was his insatiable curiosity. He was always at my elbow asking questions and that quality must have been a prime motivation for him at the University of Arizona where he obtained his three degrees. At times I felt that he was giving me the third degree! His particular interest is ecology, and in that field he has done extensive study in the desert ecology of the Southwestern United States and Africa. Other studies include ethnobotany of the Indians of Western Mexico and the evolution of island vegetation. He also is vitally interested in the implications of over population on our rapidly deteriorating environment.

This accounts for four of our former students who are close at hand and in whose progress we delight. All are doing excellent work and are recognized in their fields; and beyond that have found a life work in which they can be happy.

Among other former students who have worked at the Museum: Dr. Robert Gaal was Curator of Mineralogy for several years. Mr. Gale Sphon has been a student worker and has recently been added to the Invertebrate Zoology department. Peter Oringer is still in college, but is employed on a grant for research in the same department.

Frequently former students come by for a visit. Dr. Philip Ogilvie and his family stopped in recently on their way to Oklahoma City where Phil has been chosen as director of the zoo . . . Susan Lecky Savage brought in her two children this summer. Her husband is a professor in the art department at the University of Illinois. Susan is a painter and has already had one man shows . . . Lawrence Sprecher, one of my first students, is now assistant City Manager of Burbank . . . Dr. Jay Savage is now professor of zoology at U.S.C. and active in research and field work in Costa Rica . . . Barbara Joe Hoshizaki is an associate professor of biology and botany at Los Angeles City College . . . Dr. Leslie Marcus is an associate professor of biology at Queen's College, New York and is spending summers recording La Brea bones on I.B.M. cards for later analysis . . . and so the visits continue month after month through the years.

Over three thousand students have studied at the Museum in the Workshop program since its beginning in 1944. Each year about one hundred and seventy five students are accepted from the schools in Los Angeles County. Some of these take only a year of study. However, some come as early as the ninth grade and may spend four years at the Museum. Classes are offered on Saturday mornings with occasional all-day or week-end field trips. The student's own interest is at such a peak that they have organized their own Museum Student Association which meets once a month. Some speakers are brought in from the community, but most of the programs are presented by the students themselves who describe their research projects or discuss current scientific findings and issues with their colleagues.

This is the fourth survey of former students and from it we find that the greatest values to the students are threefold, and concern: (1) the relations of students to other students with similar interests; (2) the opportunity to work with scientists and (3) the training in scientific procedures and attitudes which simplify their own future progress.

About eighty five percent of the former students have gone into science careers. This includes such occupations as medicine, medical technology, pharmacy, nursing and public health in both private and government agencies. Many are now employed in industry as engineers in many fields, mathematicians, designers, consultants, etc. Large numbers are teaching in medical schools, universities, secondary and elementary schools. Also, careers out of the fields of science cover a wide area. We have a well-known Spanish dancer, several preachers and nuns, a harpist, a TV art director, a poet, a pottery specialist and a variety of others.

Our files are full of hundreds of reports of successful young people. Many feel that the Museum Workshop opened the door to science careers, but many more feel invaluable help and training was provided at the Museum. Certainly many young lives have been enriched by the contacts with the science and education staffs. And the Museum has made many valuable friends in the scientific community.

Carl Gage

Dr. Fred Truxal instructing the entomology class on a field trip in 1952. Carl Gage is in the front row, second from the right. Carl Gage examines his first insect model made in 1952. One of his latest models for the marine hall is also shown.



1968



1952

Jim Northern

Jim Northern, upper center, on the Cabazon mammalogy trip. Carolyn Nigg, who later became his wife, is standing to his right. James Northern now assists Dr. Stager in the ornithology department.



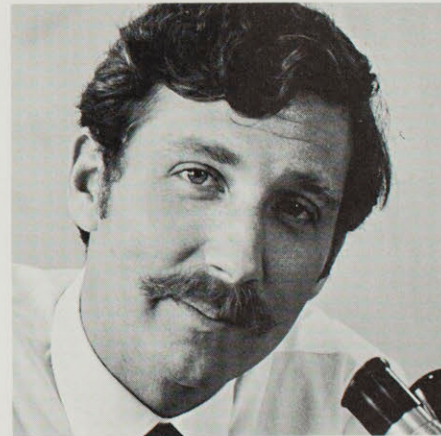
1968



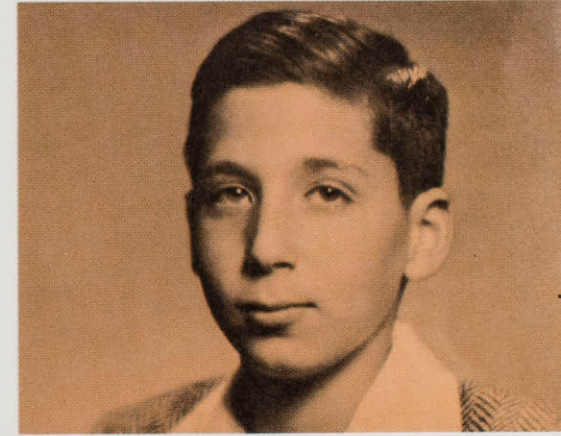
1952

Dick Felger

Dick Felger pictured about the time he became a student in the Natural Science Workshop. Richard Felger is the new curator in charge of the Botany department.



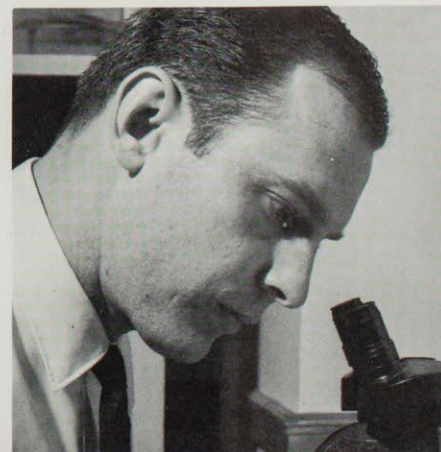
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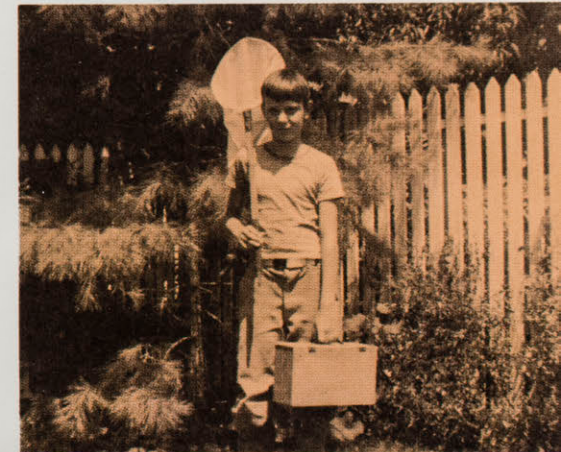
C. 1950

Charles Hogue

This young entomologist, Charles Hogue, has become the head of the Museum entomology department. Charles Hogue is a specialist in flies and related insects.



1968



C. 1950

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